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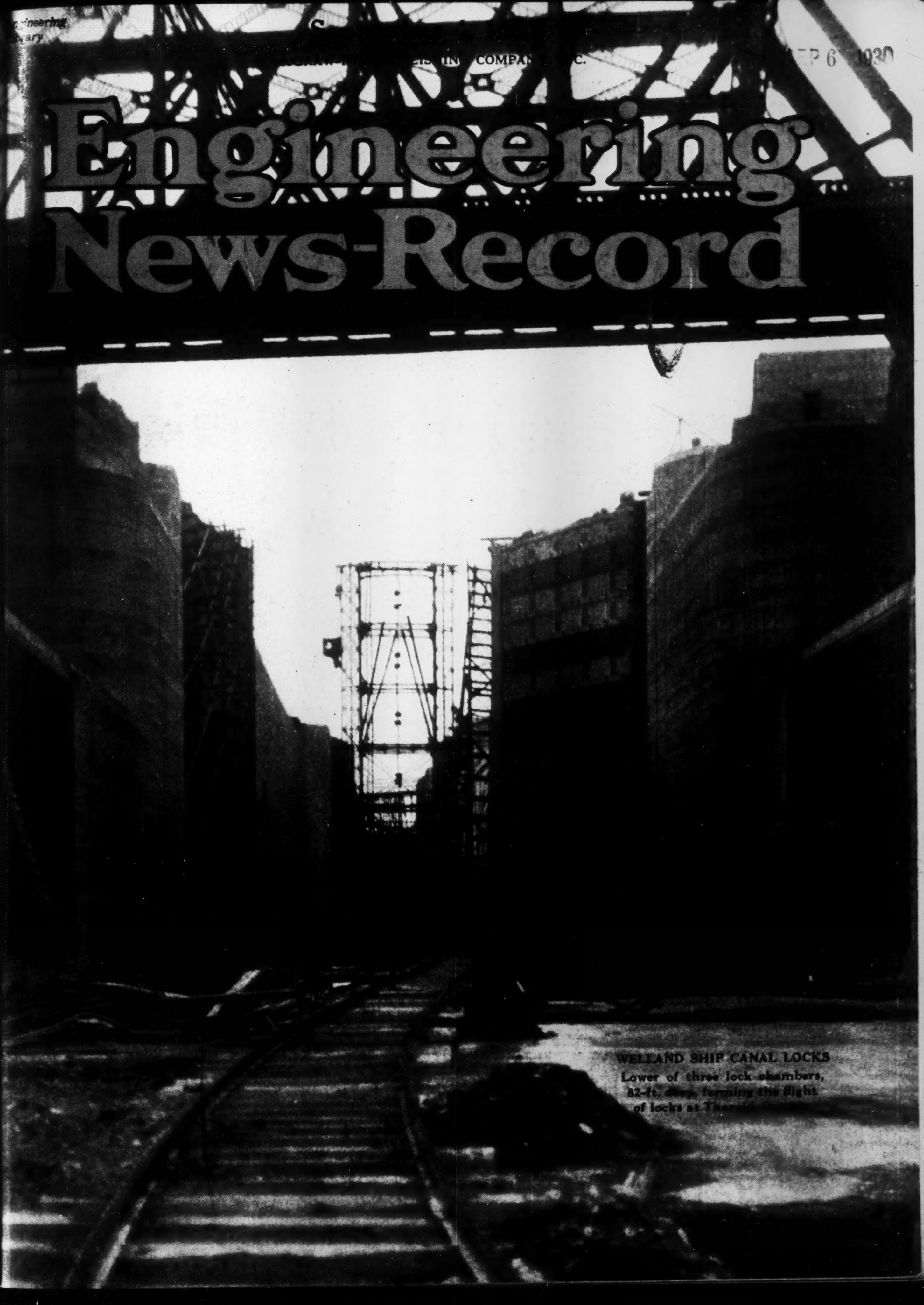

**WELLAND SHIP CANAL LOCKS**
Lower of three lock chambers,
82-ft. deep, forming the flight
of locks at Thorold, [illegible]

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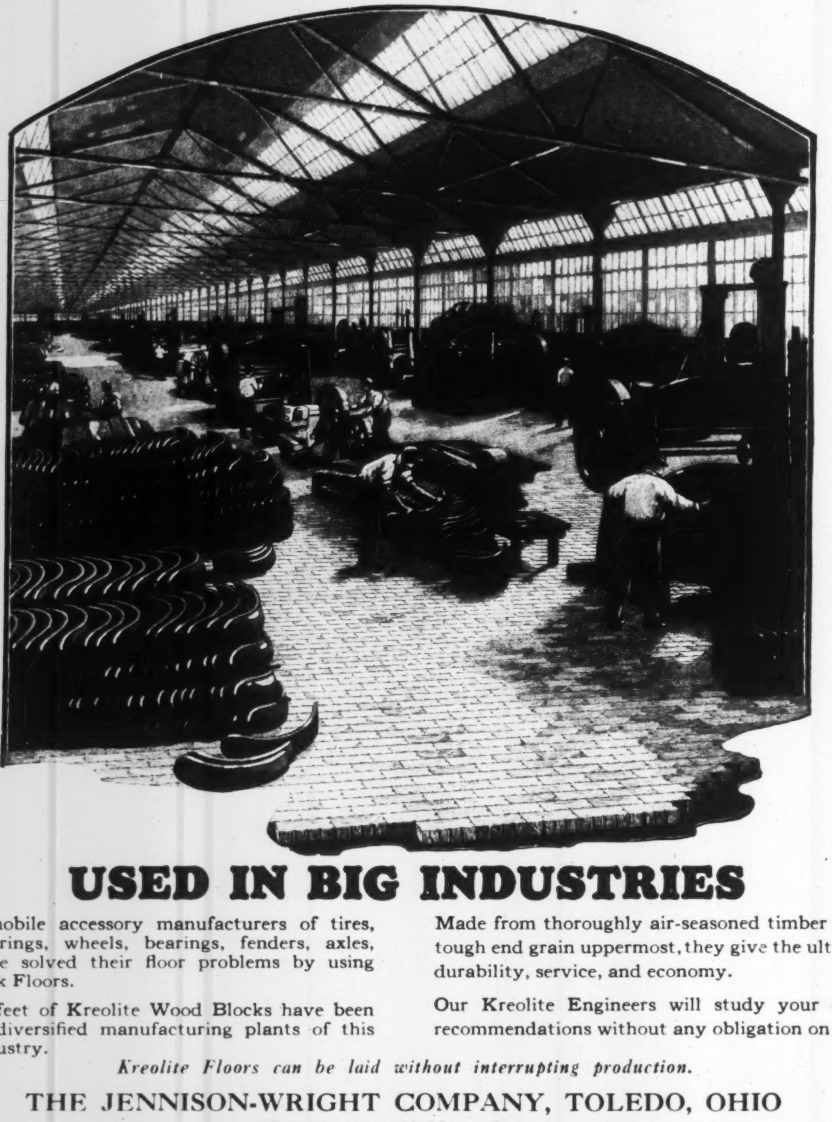

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# ENGINEERING NEWS-RECORD

*A Consolidation of Engineering News, Engineering Record,*
*The Sanitary Engineer, and The Contractor*

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## Contents for September 4, 1930

Volume 105, Number 10

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Welland Ship Canal Built for Deep-Draft Vessels . . . . . . . . . . 356

Deep Foundations at Cleveland Union Station . . . . . . . . . . . . . . 363

Geophysical Study Predicts Rock Conditions at Tunnel Site . . 364
By E. E. Carpenter and E. G. Leonardon

The Editor Afield—In the Dakotas and Wyoming . . . . . . . . . . 365

New Type of Pier Foundations on Railroad Bridge . . . . . . . . . . 366

Crane Runway Columns Reviewed . . . . . . . . . . . . . . . . . . . . . . . . 369
By Robins Fleming

Rapid Obsolescence Overtakes a Six-Year-Old Building . . . . . . 370

New York Subway Construction—II . . . . . . . . . . . . . . . . . . . . . 371

Hydraulic Characteristics of Flow of Water Around Bends . . . 376
By D. L. Yarnell

Rotary Pressure-Mixer Basic Unit in Asphalt Plant . . . . . . . . . . 377

Editorial . . . 353 Letters . . . 378 News . . . 379 Equipment . . . 385

Business News . . . 387 Material Prices . . . 390 Unit Prices . . . 393

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## Job 1873

REINFORCED CONCRETE BRIDGE ACROSS LAKE PONTCHARTRAIN constructed for the New Orleans Pontchartrain Bridge Company.

*Engineers:—*
Ford, Bacon & Davis.

2,856 Precast Piles.

Total length from beginning of one approach to end of other approach 81,250 ft.

## Job 2125

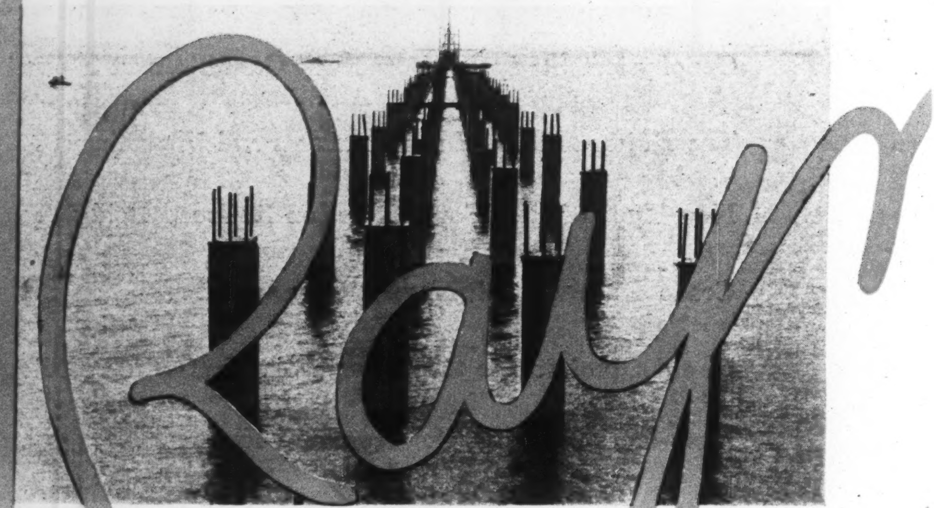
JAMES RIVER BRIDGE, Newport News, Va.

*Owner:—*
James River Bridge Corporation.

*Engineers:—*
J. E. Greiner Company.

*Gen'l Contractors:—*
Turner Construction Company.

Precast Piles placed by Raymond Concrete Pile Company—2,922.



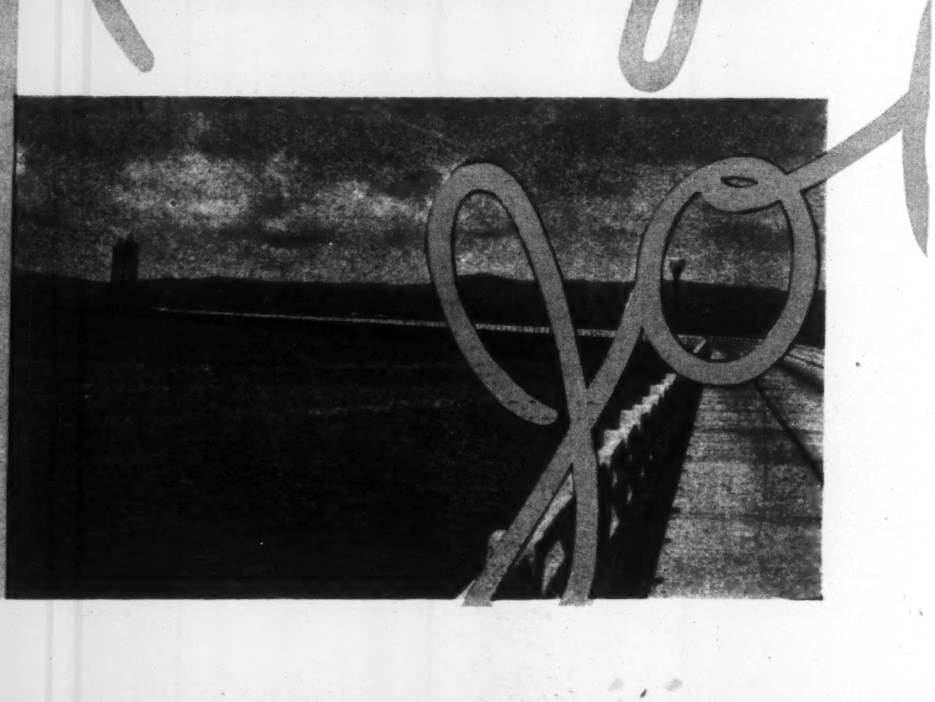
## Job 2150

SAN FRANCISCO BAY TOLL BRIDGE, San Mateo—Hayward, Calif.

Length of bridge proper 7.1 miles.

4,854 Precast Piles.

*Owner:—*
San Francisco Bay Toll Bridge Co.



## RAYMOND CONCRETE PILE COMPANY

**NEW YORK:**
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111 West Monroe St.
Raymond Concrete Pile Co., Ltd., Montreal, Canada

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# ENGINEERING NEWS-RECORD

A McGraw-Hill Publication — Established 1874

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. Schmitt, *Editor*

Volume 105 NEW YORK, SEPTEMBER 4, 1930 Number 10

## *Safety Still Lags*

PROGRESS toward greater construction safety is disappointingly slow, in spite of the noteworthy safety performances achieved in certain lines as discussed in this page two weeks ago. Construction accidents still figure too often in the news, both in building and in general engineering construction. An apathetic attitude toward the subject is made evident also by the thin program of the construction division at the convention of the National Safety Council a month from now. The leaders of construction, it appears, remain largely unconvinced of the value of the safety movement. There are many conflicting interests, some for and some against safety promotion, and their clashes have the effect of preventing advance. What the situation requires is a more unified and determined attack on the problem, based on adequate understanding of the importance of safety work and a conviction that the accident record of the construction industry can be made better. Continuing delay is harmful to the industry and fosters public belief that construction is inherently dangerous. It harms not only those who favor construction safety work but in the end also those who oppose, and hurts the industry by condemning it in the mind of the community.

## *Learning by Example*

THE COMING international road congress stands out prominently and favorably in a discouraging field—the field of international congresses. The past few years have seen many international gatherings, with results so startlingly deficient as to suggest the inference that international congresses are utterly useless. Even the Tokyo Engineering Congress, with its extensive social element, accomplished nothing tangible toward technical progress, but instead consumed many days' time that might have been better spent in industrial visits and private exchange of experience. Power, building and other international congresses of recent months have been even less constructive. But the coming road congress is of a different kind. It deals with a new activity, strongly developing in all parts of the world, and involving the same broad problems everywhere. Even in the United States, the foremost region of the world in road modernization, the growth of knowledge is barely keeping pace with increasing needs, and new road problems are growing up faster than our ability to plan, construct and administer the highways. The economics of the subject have hardly been touched and confront us with a wide field for future study. If these things are true in our own country, they are much more true in the international field. This being so, and road service being closely the same the world over, international discussion of highway problems presents remarkable possibilities of mutual enlightenment. A strong program has been prepared for the congress, fortunately. It remains, then, for the actual conduct of the congress sessions to convert these possibilities into reality. If it succeeds, the delegates from each country of the world will go away richer by having learned from the example and experience of the others.

## *Metal-Base Pavement*

AN EXPERIMENT about to be tried in Illinois promises to open new possibilities in road building. A pavement consisting of a wearing surface laid on an iron plate directly on the subgrade is to be tried out in practical service. It represents a wholly new conception in the field of paved roads. The massive concrete slab which in the course of the past quarter century has established itself as a prime essential of heavy-duty road construction is to be replaced by a thin sheet of rolled metal plate having far less bending resistance than the concrete slab which it displaces, but in compensation having a high degree of strength and toughness as contrasted with the brittleness of the present type of base. Many serious questions raise doubt as to whether the experiment will succeed, and if so, whether it will prove suited to all or some limited types of subgrade soil. But these for the present mean nothing more than that the experiment is worth trying. It offers so many possibilities, in relation to cost, adaptability and design of the road as well as its combination with road auxiliaries, that the experiment is sure to engage close interest on the part of all concerned in any way with road construction.

## *Promoting Natural Resources*

A NOVEL innovation is being put into effect this week. The Western Society of Engineers is staging in its rooms an exhibit of the geological-engineering conditions within the State of Illinois. The society invited the state geological survey to exhibit its long-accumulated scientific data on the mineral wealth of the state. During the exhibit a series of afternoon conferences is held with manufacturers, business men and potential users of these natural resources. M. M. Leighton, chief of the survey, leads these conferences, discussing each mineral product with respect to mode of occurrence, availability, production, preparation and use, and setting forth its commercial and economic values as well as the geological-engineering conditions which influence it. Civil engineers and contractors are to be served in three of the nine conferences to be held next week: Sept. 9 on aggregates and building materials, Sept. 10 on geological data affecting the location, construction and maintenance of highways, railways, transmission and telephone lines and pipe lines, and Sept. 12 on water resources. Four evening lectures on geology, of more popular character, add to the interest of the occasion. The entire movement is the outgrowth of a definite aim on the part of the officials of the society to make the organization more generally useful to the public. Something similar has been done by the Colorado society, which for some time has co-operated with the Denver Chamber of Commerce in promoting the resources of the state; a recent report on glass sand is a model of excellence. Whatever the ultimate results in developing resources may be, anything that will bring the scientist and man of dollars closer together is sure to be gain for both.

## *No Change of Road Policy*

BECAUSE we suggested, two weeks ago, that improvement of local roads offers the best or only opportunity to utilize road construction for farm relief, some readers have concluded that we are now aligned on the side of the local-road propagandists. That is not the case. We have long been against all attempts to disturb the main-road program on which the existing system of federal aid is built up, and will continue in this position. It would be utterly ruinous to the progress of road building were such disturbance allowed to occur; this is as true in 1930 and 1931 as in prior years. But the proposals put forward by the government last month were for farmer employment. Road construction was merely taken as the readiest means in sight. However, as the paving of main roads cannot serve usefully to employ much farmer labor, we pointed out the advisability of turning to work on local roads in meeting the emergency. The main-road program need not have been weakened, either now or later if the suggestion had been carefully applied. Since it later developed, however, that the government's relief scheme was intended not for drought relief but for general business promotion, local roads are wholly out of the picture.

## *Accelerating Construction*

IT IS a seductive thought that such an activity as road construction may be speeded up at any time when it is necessary to create added employment. The two available methods for making this possible are, first, to maintain so large an engineering department in each state organization that its reserve capacity will at short notice enable it to plan and conduct a largely increased volume of work; second, to prepare plans in advance and hold them in the files until an emergency calls for sudden speeding up of construction. We believe that both expedients are ineffective. They conflict with the facts of road work in most parts of the country. State highway organizations are fairly well taxed by their regular operations, and few states would support an organization of double strength for service in a rare emergency. On the other hand, the normal forces engaged in highway planning cannot speed up their output at will. As to long-time advance preparations of plans, experience indicates that road requirements and problems evolve too rapidly to make this useful. The history of many partly completed road projects affords evidence that any waiting time between different stages of an integral construction enterprise is likely to involve waste through extensive modifications and adjustments. Property changes and relocations also cannot be fixed far ahead of actual field operations. For these and related reasons the belief that a reservoir of road plans can be formed, to be drawn upon at will for a sudden increase in contract volume, is little more than a hopeful dream. It does not appear suited to forming part of a deferred public-works plan for meeting emergency conditions, either of general depression or of regional distress.

## *Welland Canal*

WITH little attention from the outside world a great engineering project has been under way during the past seventeen years in Canada. Before the war the Canadian government began the construction of a new canal across the Niagara peninsula to replace the old and outgrown Welland Canal. The war slowed up and finally stopped the work, but in the past few years construction has been pushed and now most of the new canal is in use. What little remains to be done will be completed before spring.

The new Welland ship canal ranks high among the large artificial waterways of the world. Its largest lock is second in size only to the lock in the new Ijmuiden canal in Holland, and the 46½-ft. lift of each of its seven lift locks is greater than that of the Panama Canal locks or the high-lift locks of the New York state barge canal. At Thorold a flight of three locks gives a combined lift of 139½ ft. in surmounting the steepest part of the Niagara escarpment. This, curiously enough, is the same geological formation which far to the east in New York State made necessary the construction of the highest lift locks of the barge canal, where it rises 81 ft. in a flight of two locks at Little Falls.

These physical features of the Welland Canal are apparent alike to engineer and layman. For the engineer the canal in its construction holds other things of interest. Foremost among them is the engineering skill displayed in the general design and details of the canal structures. Recent developments in electrical operating equipment and signal systems also were studied and adapted to canal purposes, with the result that the new Welland Canal marks a definite step forward in the design of inland waterways.

In another respect the canal is notable. Contract drawings were made unusually complete, so that nothing was left to the contractor's imagination. In some instances the drawings went so far as to lay down his line of attack and specify how his temporary structures were to be built. That was especially true of the difficult task of carrying Chippawa Creek under the canal. There, as in some other instances, the requirement that traffic in the existing canal be not interrupted made it necessary to go to such unusual ends.

The expenditure of so much engineering skill and money to replace the former Welland Canal naturally raises the question of why the work was undertaken. Is a modern ship canal needed between Lake Erie and Lake Ontario? The answer is emphatically affirmative. Aside from any other considerations the traffic through the old canal long ago reached a point where some more adequate means of passing from lake to lake had become imperative. The total number of vessels using the canal during the period of reconstruction increased from 3,300 in 1913 to a maximum of 7,600 in 1927, with some falling off in 1928 and 1929. In recent years it has not been unusual for vessels to be delayed many hours awaiting their turn. Increased capacity was needed. It could not be provided in the old canal. A new canal had to be built; common sense dictated that it be built with an eye to the future, which meant with the construction of a ship canal down the St. Lawrence River in view.

The new canal has been so built. Provision is made for an ultimate depth of 30 ft., with 25 ft. as the present minimum depth. Obviously, its capacity will be far in excess of present needs, but plans are being made to get the maximum amount of value from the investment by the construction of a new deep lake port with modern grain-handling facilities at Prescott to induce grain boats on the upper lakes to go down through the canal to the head of shallow-draft navigation on the St. Lawrence.

The new canal, as in the case of the old one, will be toll free to Canadian and American vessels. Hence it would be difficult to justify the expenditure of more than one hundred million dollars on the canal simply as an investment expected to bring in immediate return. But as an investment in the future of Canada few will doubt the wisdom of the undertaking.

## *A Successful Undertaking*

WITH the performance record of nearly 3,500 contracting concerns in hand and verified, or rapidly being verified, the Bureau of Contract Information is prepared to receive subscribers for its service. Sponsored by the Associated General Contractors and financed by 34 of the security companies writing contract bonds, this credit activity has recorded remarkable progress. In less than two years it has overcome skepticism of its success, has shown its ability to secure performance records of contractors, and has obtained not only the number of records named but more detailed and better verified records than any agency employing contractors or extending credit to them has ever before secured.

Definite progress began with the conferences of 1924 and 1925 of committees representing the five national engineering societies, the American Institute of Architects, the Associated General Contractors and two leading associations of surety bonding companies and agents. Out of these conferences there came the standard questionnaire now widely used in the award of public and private construction contracts, and a definite recommendation that a national bureau be organized to determine and record the performance records of contractors. There followed a period of education.

General skepticism greeted the idea that success would attend an attempt to secure true performance records. Public officials, architects, engineers, surety companies, banks, vendors and commercial credit agencies pointed to their difficulties in the past in securing such information and were a unit in decrying its possibility. But in August, 1929, the surety companies decided to venture the experiment and to finance it up to the point at least where proof would be had that it is or is not practicable. Two months later they subscribed $35,000 for beginning work; in April, 1930, they subscribed a second $35,000, and recently they have authorized a third assessment of equal amount.

Having the need of better knowledge of the credit standing of contractors, success in the work of the bureau rests largely on adherence to the principle that its function is solely to provide verified factual information. It makes no recommendations and passes no opinion; it makes no statement of fact that has not been verified, and it discloses no source of verification information. It is a non-profit, fact-finding and reporting institution within the construction industry for the service of that industry. Its service is without charge to those responsible for the award of construction contracts. It asks payment for its service only from those who sell to and give credit to contractors for profit.

Ultimate success of the new credit agency lies in its adherence to the purpose of fact finding and in the fullness and accuracy of its findings. Obviously the records must include not only those contractors who voluntarily lay bare their business history and invite scrutiny but those contractors whose records have to be sought out. Those who award contracts are far more in need of the records that are faulty than of those which disclose no error. It may be noted that the bureau proposes to determine these censurable records fully and accurately. Meanwhile the voluntary reports are building up a list of contractors whose skill and integrity are an open book to awarding agencies.

In appealing for subscribers to its service the Bureau of Contract Information has progressed in its work to a point where it can offer real returns for the money invested. It needs now the support of the whole industry in its financing. So far this has been provided by organized contracting in the beginning, and later, in meeting the greater cost, by the surety companies. These divisions of the industry have carried the new contractor's credit activity to demonstrated success; it is now time for the professional, financing and selling divisions to come forward with support. The bureau invites investigation of its work with this purpose in view.

## *Railroad Grouping Progresses*

RAILROAD consolidation has made a long step forward through the reported agreement between the Baltimore & Ohio and the New York Central Railroad as to disposition of the latter's holdings of Reading railroad stock and the subsequent announcement that control of the Chicago & Alton has passed to the B. & O. Recently the B. & O. was authorized by the Interstate Commerce Commission to purchase control of the Buffalo, Rochester & Pittsburgh Railroad and the Buffalo & Susquehanna. Consummation of these changes in ownership will give the Baltimore & Ohio all of the major railroad lines assigned to it in the Interstate Commerce Commission's consolidation plan except the Detroit, Toledo & Ironton, giving it a line extending from Kansas City on the west to New York harbor on the east. The Pennroad Corporation controls the D. T. & I. Meanwhile the Interstate Commerce Commission is bringing pressure to bear upon the Pennsylvania Railroad to divest itself of control of the Wabash and Lehigh Valley railroads under charge of violation of the Clayton anti-trust law. Under similar threat the B. & O. is preparing to divest itself of control of the Western Maryland. These three roads are needed for the commission's fifth Eastern trunk line, the Wabash-Seaboard system.

It is barely seven months since the I. C. C. announced its plan for railroad consolidation and yet in that time more progress has been made than in many months previously. By encouragement here and by threat of pressure there, the commission, now that it has a definite plan laid down, has been able to accomplish much more than seemed possible late last year when the plan was promulgated. Obviously, many high hurdles remain to be overcome before widespread railroad consolidation is accomplished; nevertheless, each railroad that is transferred to control approved by the commission helps to simplify the task for the commission and makes it more difficult for those who oppose consummation of the plan. These rapid developments are bringing to naught the predictions of those who, only a few months ago, said that no plan of consolidation ever could be laid down in advance with any reasonable expectation of its being carried out.

# New Welland Ship Canal Built for Deep-Draft Vessels

## Lake Ontario Made Accessible to Large Vessels Used on the Upper Lakes by an Enlarged Canal Across the Niagara Peninsula in Canada—Seven Locks Overcome a Head Requiring 26 Locks in Old Canal

AT A COST of more than $120,000,000, the fourth canal to be built between Lake Erie and Lake Ontario to provide slack-water navigation around Niagara Falls is now nearing completion. Much of the new waterway is in use; the remaining portion will be ready for operation at the opening of navigation next spring. After that time there will be available an almost straight canal with only eight locks which will permit the passage of vessels with drafts up to 25 ft., whereas heretofore no vessel drawing more than 14 ft. could pass up or down from lake to lake and then only through a tortuous channel having 26 small locks.

The new Welland ship canal was begun in 1913 as part of a program laid down by the Canadian government, which called for a ship channel of a depth of 25 ft. from Lake Erie down to Lake Ontario and from Lake Ontario down the St. Lawrence River to Montreal. With a channel of that depth, grain moving eastward through the Great Lakes to tidewater would not have to be trans-shipped at the lower end of Lake Erie to smaller vessels capable of navigating the Welland and St. Lawrence canals with their 14-ft. draft limitation, or transferred to railroad cars in order to complete its journey to the sea. International problems stood in the way of building a ship canal down the St. Lawrence River, but none were involved in the reconstruction of the Welland Canal, as it lies wholly within Canadian territory. Increasing congestion of traffic in the Welland Canal made an early start of the work desirable.

Contracts for the construction of a new ship canal were let in the fall of 1913, but within less than a year the World War started and by 1916 it had caused an almost complete cessation of the work. In 1918 the original contracts were canceled. From 1919 to 1921 work was continued on a cost-plus basis with many interruptions due to labor and other troubles. By 1921 conditions in the construction industry had become more stabilized, and new unit price contracts were let in 1921 and the following year. Thus, while 17 years have elapsed since construction was started, actually only about 10 years have been required for the completion of the undertaking.

Engineering studies for the canal were begun long before construction was inaugurated and were continued through the shutdown of the war period.

*Earlier Canals*—A little more than a century ago, in

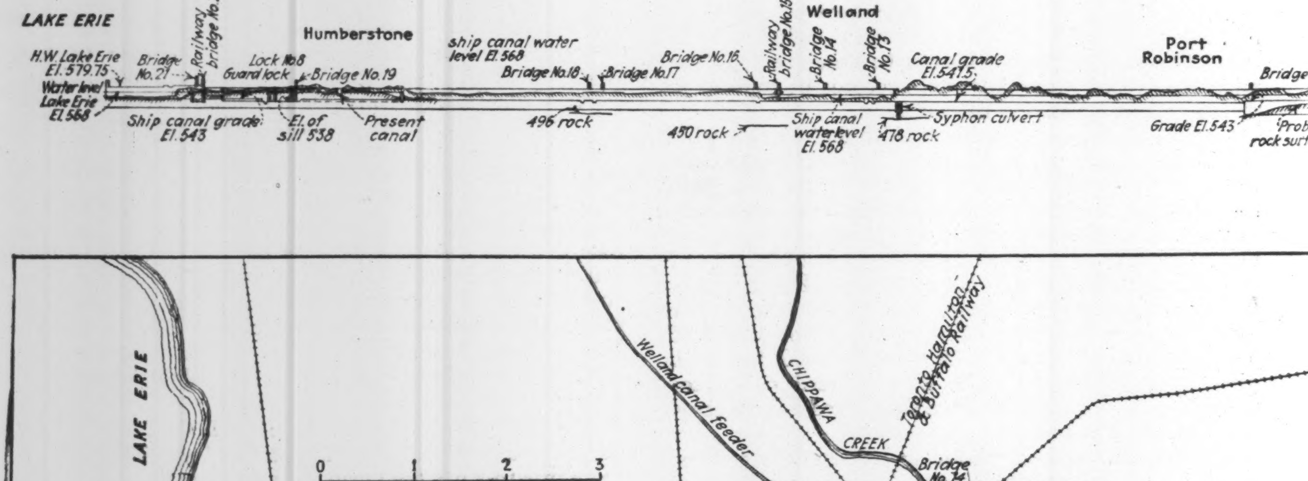

LAKE ERIE
H.W. Lake Erie El. 579.75
Water level Lake Erie El. 568
Bridge No. 21
Railway bridge No. 20
Lock No. 8
Guard lock
Bridge No. 19
Humberstone
Ship canal grade El. 543
El. of sill 538
Present canal
ship canal water level El. 568
Bridge No. 18
Bridge No. 17
496 rock
Bridge No. 16
Railway bridge No. 15
Welland
Bridge No. 14
Bridge No. 13
450 rock
Ship canal water level El. 568
478 rock
Canal grade El. 541.5
Syphon culvert
Port Robinson
Bridge
Grade El. 543
Prob
rock surf
LAKE ERIE
0 1 2 3
Scale in Miles
Welland canal feeder
CHIPPAWA CREEK
Toronto Hamilton & Buffalo Railway
Bridge No. 14
Bridge No. 15
Welland
Syphon culvert
Present Welland canal
Bridge No. 16
Bridge No. 13
Humberstone
Bridge No. 18
Bridge No. 17
Dainville
Canadian National Ry.
Present canal
New breakwater
Present Western breakwater
PORT COLBORNE
Ship channel
Present Eastern breakwater
Bridge No. 21
Bridge No. 20
Lock No. 8
Bridge No. 19
Present Welland canal
Bridge No. 12
Port Robinson

FIG. 1—PLAN AND PROFILE OF THE NEW WELLAND CANAL SHOW

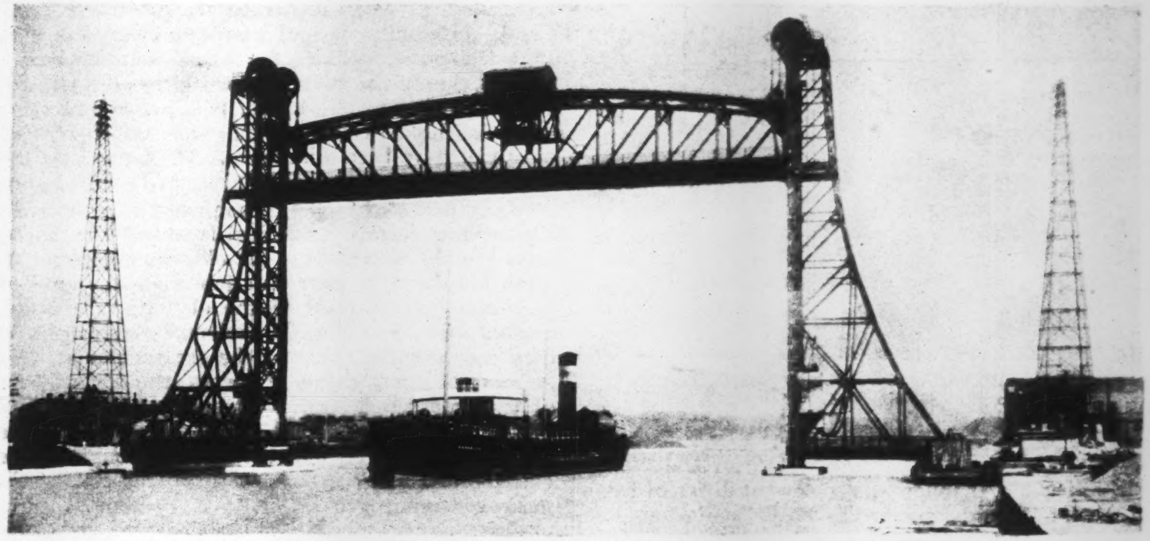
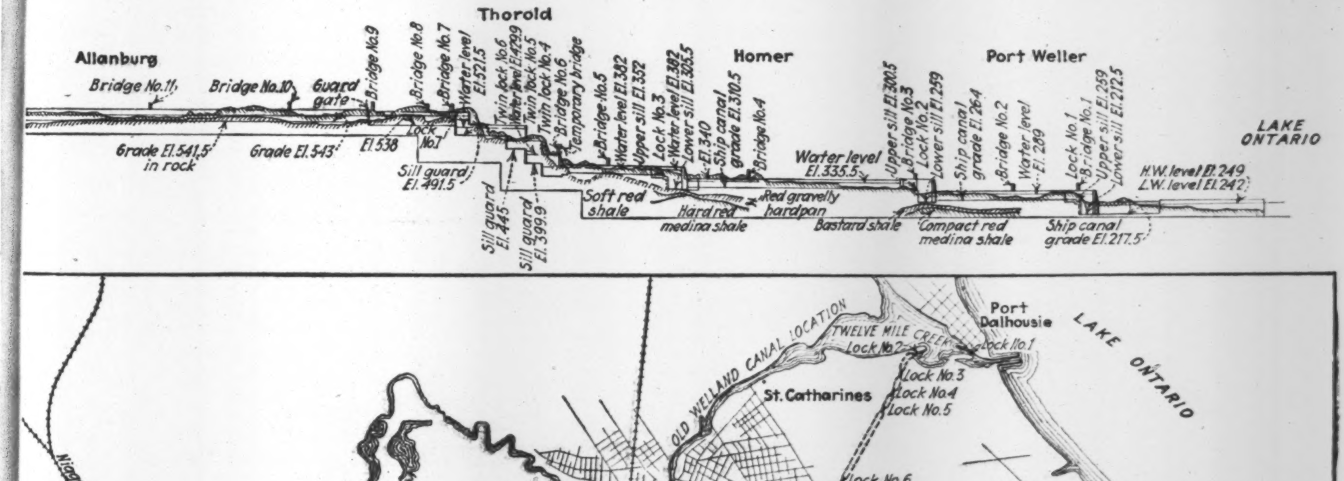


FIG. 2—HIGHWAY BRIDGE OVER A COMPLETED SECTION OF THE CANAL AT PORT ROBINSON

1824, construction of the first canal around Niagara Falls was undertaken as a private enterprise. That channel extended from Port Dalhousie on Lake Ontario to Fort Robinson on Chippawa Creek, from whence small vessels could descend to the Niagara River and up the Niagara River to Lake Erie. It was completed in 1829. The canal had 40 locks 110 ft. long by 22 ft. wide and 8 ft. deep over the sills. Later it was extended to Port Colborne on Lake Erie to save distance and eliminate the difficult navigation of the open channels in Chippawa Creek and the Niagara River. Its length from lake to lake was 27½ miles.

In 1841 the Canadian government bought the canal and built new stone locks 150x26½ ft., 9 ft. deep over the sills, reducing the number of locks to 27. In 1853 the navigable depth of the canal was increased to 10 ft. Much of this canal is still in existence, being used in part for power development. Its cost, including enlargements, was $7,630,000.

In 1887 the third canal, now being replaced, was


Thorold
Allanburg
Homer
Port Weller
Bridge No.11
Bridge No.10
Guard gate
Bridge No.9
Bridge No.8
Bridge No.7
Water level El.521.5
Twin lock No.6
Water level El.479.9
Twin lock No.5
Twin lock No.4
Bridge No.6
Temporary bridge
Bridge No.5
Water level El.382
Upper sill El.352
Lock No.3
Water level El.382
Lower sill El.305.5
El.340
Ship canal grade El.310.5
Bridge No.4
Grade El.541.5 in rock
Grade El.543
El.538
Lock No.7
Sill guard El.491.5
Sill guard El.445
Sill guard El.399.9
Soft red shale
Hard red medina shale
Red gravelly hardpan
Water level El.335.5
Upper sill El.300.5
Bridge No.3
Lock No.2
Lower sill El.259
Ship canal grade El.264
Bridge No.2
Water level El.289
Lock No.1
Bridge No.1
Upper sill El.259
Lower sill El.212.5
LAKE ONTARIO
H.W. level El.249
L.W. level El.242
Bastard shale
Compact red medina shale
Ship canal grade El.217.5
Port Dalhousie
LAKE ONTARIO
OLD WELLAND CANAL LOCATION
TWELVE MILE CREEK
Lock No.2
Lock No.1
Lock No.3
Lock No.4
Lock No.5
St. Catharines
Lock No.6
Lock No.7
Present canal
Niagara, St. Catharines & Toronto Railway (Electric)
Gate yard
800'
Port Weller
Bridge No.1
Bridge No.2
Lock No.1
Pondage for lock No.1
Waste weir
Lock No.2
Bridge No.3
Waste weir
Lock No.8
Lock No.9
Present Welland canal
Bridge No.11
Bridge No.10
Thorold
Lock No.10
Lock No.3
Bridge No.4
Bridge No.5
Pondage for lock No.2
Waste weir
Homer
Pondage for lock No.3
Allanburg
Canadian National diversion
Bridge No.9
Turning basin
Guard gate
Bridge No.8
Bridge No.7
Lock No.7
Bridge No.6
Present Welland canal
Twin locks No.4, 5 & 6
Lock No.16
Pondage for flight locks

ITS RELATION TO THE OLD CANAL AND THE NATURAL WATERWAYS

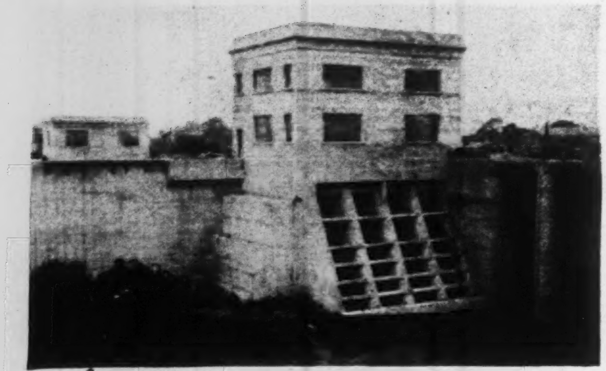


FIG. 3—LOCK CONTROL TOWER AND SUPPLY INTAKE

The control room is in the upper part of the building housing the intake gate mechanism. Below is the water intake with trash-rack supports in place. At the right is the waste wier and at the extreme left two buildings on opposite walls of the lock to house the gate-operating machinery.

opened to traffic. It followed a somewhat different route from that of the previous canal, was 26¾ miles long and had 26 locks 270x45 ft. with lifts of from 12 to 14 ft. and a depth over the sills of 14 ft. That canal cost $25,375,000.

*New Ship Canal*—The canal now nearing completion is a radical departure from its predecessors and shows in a striking way the progress made in canal design in recent years. In the first place, the adoption of an unusually high lift of 46½ ft. for the locks made it possible to reduce the number of lift locks from 26 to 7 and also made possible a considerable shortening of the length of the canal through a direct ascent of the Niagara escarpment—the same rock outcrop through which the Niagara River cuts its gorge a few miles east—rather than by a side-hill route, as had been necessary in the earlier canals with their low-lift locks. A plan and profile of the new canal is shown in Fig. 1.

The changed alignment of the canal below the Niagara escarpment made it desirable to build a new port on Lake Ontario, Port Weller, at the mouth of Ten Mile Creek, three miles east of the present canal terminal at Port Dalhousie. Above the escarpment the new canal follows closely the route of the old one but on a much straighter alignment. In all, nearly two miles of distance has been saved and the dangerous curves of the old canal have been eliminated. On Lake Erie the existing harbor at Port Colborne is used.

Maintenance of traffic through the present canal was a governing factor in the final layout of the new canal, as it crosses or intersects the old one at several places. That consideration dictated establishing the level of the new canal at the level of the old one where the two crossed below the Niagara escarpment and again where they cross near the top of the escarpment at Thorold. Beyond the top of the escarpment the matter of level was of less importance as the water level in the old canal fluctuated with the fluctuation of Lake Erie, while the new canal is to be maintained at a constant level of extreme low water in Lake Erie. This stabilization of the long summit level of the canal is accomplished by the use of a guard lock at Port Colborne, the eighth lock in the canal. Normally this lock will overcome a head of 3 or 4 ft., but during storms the head may increase to as much as 12 ft.

The canal runs almost due north from Lake Erie to Lake Ontario. The drop of 326½ ft. between mean water level in the two lakes is concentrated near the north end in descending the steep slope of the Niagara escarpment. The drop below the guard lock is overcome in seven locks of 46½-ft. lift each. This lift is about 14 ft. greater than that of the Panama Canal locks and 6 ft. more than the maximum lift in the locks of the New York state barge canal.

*Operating Program*—There are eight locks in the canal, one a guard lock at Port Colborne for maintaining the summit level of the canal at a uniform elevation and seven lift locks for the ascent to Lake Erie. The guard lock, lock 8, has been made 1,380 ft. long in order that

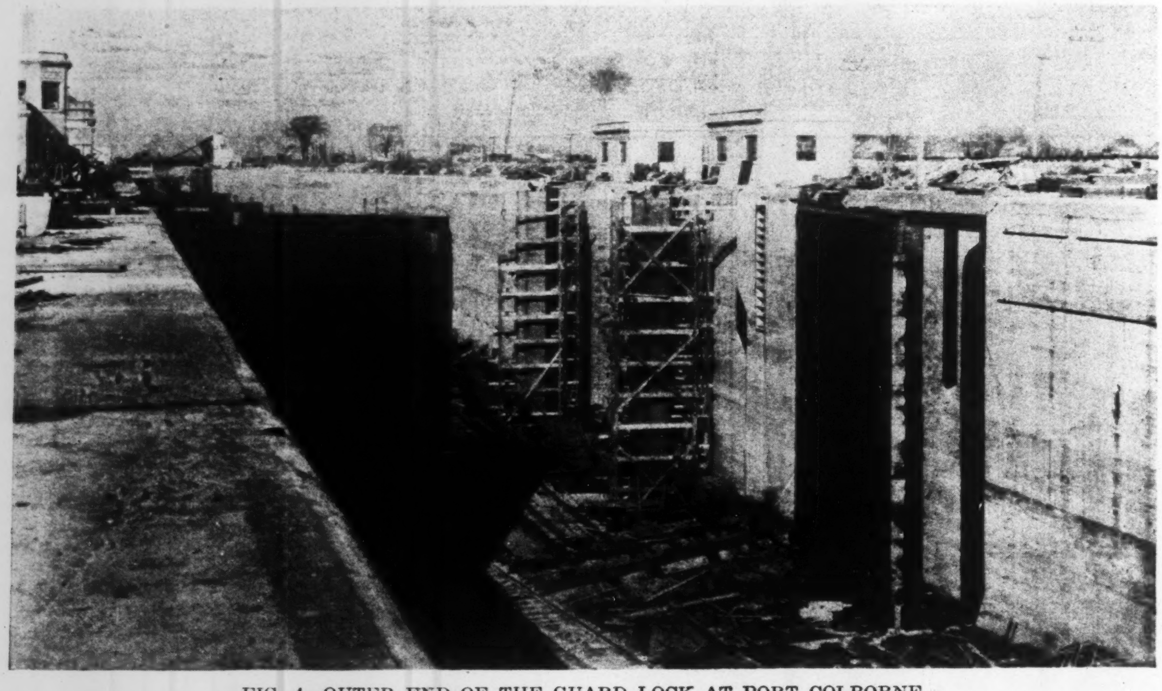


FIG. 4—OUTER END OF THE GUARD LOCK AT PORT COLBORNE

The timber unwatering gate, guard gate and service gates (both under construction) are shown in the foreground. At the far end of the lock one of the rolling-lift bridges is shown in closed position.

more than one vessel may be passed through it in one operation. Seldom will there be any great variation between the summit level and that of Lake Erie, and consequently the quantity of water required for the operation of lock 8 will not be large. What water is used will be taken from Lake Erie and discharged into the canal for use in the lower locks. Additional water for the lower locks also will be drawn from Lake Erie through a supply weir in the channel of the present canal which now bypasses lock 8.

Lock 7, at the northern end of the long summit section of the canal, is a single lock to let boats down to the pool above the flight locks at Thorold. Just above it is a guard gate which is kept closed at all times except during passage of vessels, as a precaution against draining the whole summit canal through the failure of the gates of lock 7. An added precaution is provided by having duplicate gates at the upper and lower end of lock 7 and of the twin lock No. 6 at the head of the flight of three locks down the Niagara escarpment.

The flight locks, Nos. 6, 5, and 4, each have double chambers, one for upbound traffic and the other for downbound. Otherwise a vessel might be delayed as long as two hours if another vessel, coming in the opposite direction, had entered the flight. These locks have a supply basin above lock 6 with a waste weir which discharges into an artificial channel along the route of the old canal some distance from the new canal. The water so disposed of is returned to the canal in the pond above lock 3.

Locks 3, 2 and 1 are on a gentle slope toward Lake Ontario and are separated from each other by sections of open canal. Each is provided with a pond for water storage and a waste weir and channel parallel to the locks, as shown in Fig. 5. The emergency sluices under the waste weirs will open automatically if the pond water rises much above its normal level and threatens to overtop the banks and flood the surrounding farm lands. Such an abnormal rise might be occasioned by the failure of a gate or any similar accident in the reaches above. The spillway channels are concrete-lined and have a secondary weir at the lower end for checking the velocity of the water and destroying its energy. The lower weirs also are intended to back up the water in the raceway and thus submerge the sluice gates during the frosty season.

In a number of instances there are bridges across the lock-approach channels which will serve as a guard for the gate against ramming by a vessel out of control, sacrificing the bridge for the gates. At other points where protection is needed, fender cables are provided. These cables are 3½ in. in diameter and are mounted on an arm which operates like a rolling-lift bridge. The cable is wrapped around a stationary bollard and is arranged to unwind from another spring-drum bollard which provides sufficient tension to check any vessel before it strikes the gate.

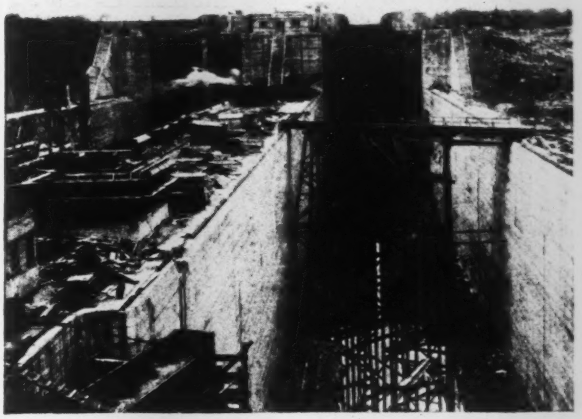


FIG. 6—TWIN FLIGHT LOCKS AT THOROLD

Looking up the flight of three twin locks at Thorold from the C. N. Ry. bridge. The lock chambers are 80 ft. wide and 82 ft. deep. The three locks give a total lift of 139.5 ft. (The C. N. Ry. bridge shown above the lower of these locks on the cover of this issue has been replaced by a rolling lift bridge.)

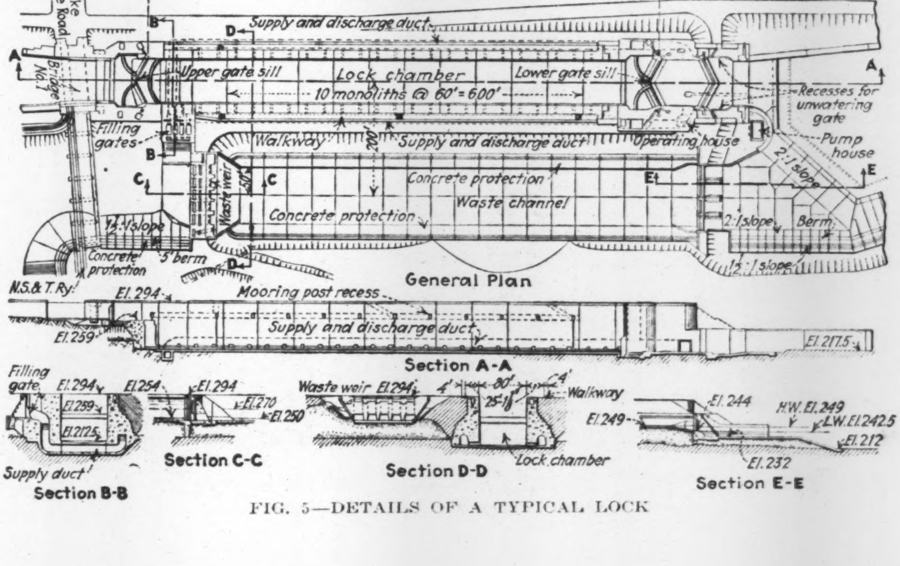

Lake Shore Road
Bridge No. 1
865' c. to c. of lock gate pintles
Supply and discharge duct
Upper gate sill
Lock chamber
Lower gate sill
10 monoliths @ 60' = 600'
Recesses for unwatering gate
Filling gates
Walkway
200'
Supply and discharge duct
Operating house
Pump house
2:1 slope
Waste weir
50'
Concrete protection
Waste channel
Concrete protection
2:1 slope
Berm
1½:1 slope
Concrete protection
5' berm
1½:1 slope
A
B
C
D
E
General Plan
N.S.& T. Ry.
El. 294
Mooring post recess
Supply and discharge duct
El. 259
El. 217.5
Section A-A
Filling gate
El. 294
El. 259
El. 212.5
Supply duct
Section B-B
El. 254
El. 294
El. 270
El. 250
Section C-C
Waste weir El. 294
4'
80'
4'
25-1
Walkway
Lock chamber
Section D-D
El. 244
H.W. El. 249
L.W. El. 242.5
El. 249
El. 212
El. 232
Section E-E

FIG. 5—DETAILS OF A TYPICAL LOCK

Water for filling the single locks is drawn through an intake located back of the approach wall in the pond above the lock, instead of from the channel directly above the gate, as is the more common practice. This arrangement does away with the objectionable currents created in drawing directly from the navigable channel. All intakes are provided with frames to support trash racks, but no racks will be installed unless found necessary. Both the intake and discharge valves are tainter or segment gates arranged so that they are under complete control at all times.

From the intake gates the water passes down into the filling culverts in the canal wall, the water for the far side passing beneath the lock floor, and from these large culverts it is discharged at short intervals through smaller lateral openings at the floor level of the lock. In unwatering the locks, the water passes out through the same ducts to discharge openings having rectangular bell mouths at opposite sides of the lock chamber below the lower gate. The energy of the discharged water is dissipated in the surge created by these two opposing streams.

*Lock Construction* — The limitations placed by the necessity of maintaining an open channel for traffic through the old canal and the character of the underlying rock largely

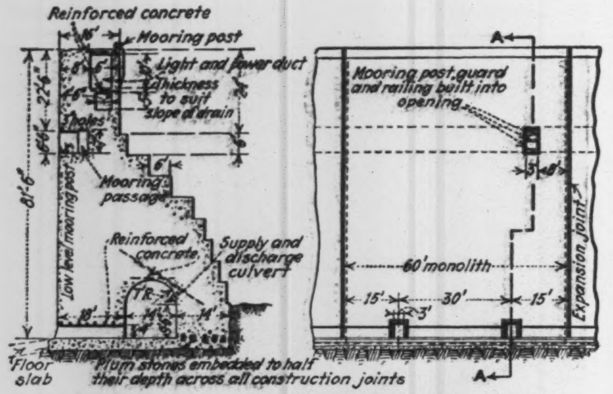

Reinforced concrete
Mooring post
Light and power duct
Thickness to suit slope of drain
Mooring passage
Low level mooring post
81'-6"
Reinforced concrete
Supply and discharge culvert
Floor slab
Plum stones embedded to half their depth across all construction joints
Section A-A
Mooring post, guard and railing built into opening
60' monolith
15'
30'
15'
3'
Expansion joint
Front Elevation of Wall

FIG. 7—DETAILS OF THE LOCK WALLS
On account of the great height of the walls two levels of mooring posts are provided at two levels. The lower level, in recesses in the walls, is reached by stair wells from the surface. Here the snubbing posts are designed to slip the mooring line when the boat raises above them.

determined the final location of the locks after their approximate location had been fixed. Generally, rock is not far below the surface at the northern end. In the final location of the locks they were so placed as to bring their walls upon firm rock at points where the total amount of rock to be removed would not be excessive.

The rock at the north end of the canal is a red shale which decomposes rapidly upon exposure to the air and is easily eroded, yet sound if protected from exposure. Consequently, in excavating for the lock structures the preliminary excavation was carried to about 1 ft. above grade, and then just before the contractor was ready to start the concrete work, the last foot of rock was excavated, leaving a fresh surface upon which to found the walls. Upon completion of the locks the underlying rock was fully grouted as a precaution against underflow and uplift.

The lock walls are of monolithic concrete, reinforced in a few places, principally over the top of the main filling culverts where tension may occur, also over the small lateral outlets where experience in the first lock showed that shrinkage cracks may develop. Where the filling culvert passes under the lock floor, the floor is heavily reinforced. In the flight locks at Thorold the center wall between the twin locks is reinforced against shear. Anchor rods are used under the lock floors as a precaution against uplift.

The usable length of the lift locks is 820 ft., the width 80 ft. and the depth over the sills 30 ft. Details are shown in Fig. 5.

*Lock Gates*—All lock gates, except the unwatering gates, are of steel. The lower gates at each lift lock are 82 ft. high by 45 ft. wide and weigh 980 tons, or 490 tons per leaf. Some of the principal details are shown in Fig. 8. The gates are of the ordinary mitering type, but the method of operation is novel. It is by a system of cables actuated by motor-driven winches, as shown in Fig. 11. With this system the gates are fully controlled in all positions. Limit switches prevent any overrun.

A novel feature of the gate is the use of safety horns on the mitering faces to minimize the danger if a gate is unmitered by a vessel nosing against it.

Both the upper and lower gates of all the locks, with one exception, are similar and interchangeable. Spare gates are provided for emergency use and a dry dock for their storage has been built adjoining the pool above lock 1. Normally, the spare gates are to be stored for painting and repair upon a shelf, from which they may be floated by raising the pond level 5 ft. A floating crane is used for replacing gates which may be damaged or need repairs. During the operating season it will lie in the harbor below lock 1.

Timber unwatering gates are located in the lock walls just below lock 1, lock 4 and at both ends of lock 8. These gates, when closed, will exclude the lake water from the outer gates at locks 1 and 8, so that the gate chamber may be pumped out for repair work. Similarly, below lock 8 and lock 4 their use will avoid emptying long sections of the channel for repair work at the lock. As the unwatering gates are almost entirely submerged at all times, and therefore inaccessible for maintenance, they have been made of timber instead of steel.

*Canal Prism*—Outside of the lock chambers the canal prism normally has a bottom width of 200 ft. and a surface width of 310 ft. At curves and at other points where operating requirements dictate the normal width is increased. Where the canal is excavated in earth, the depth of channel has been made a minimum of 25 ft., but in rock a depth of 27½ ft. was excavated to reduce the

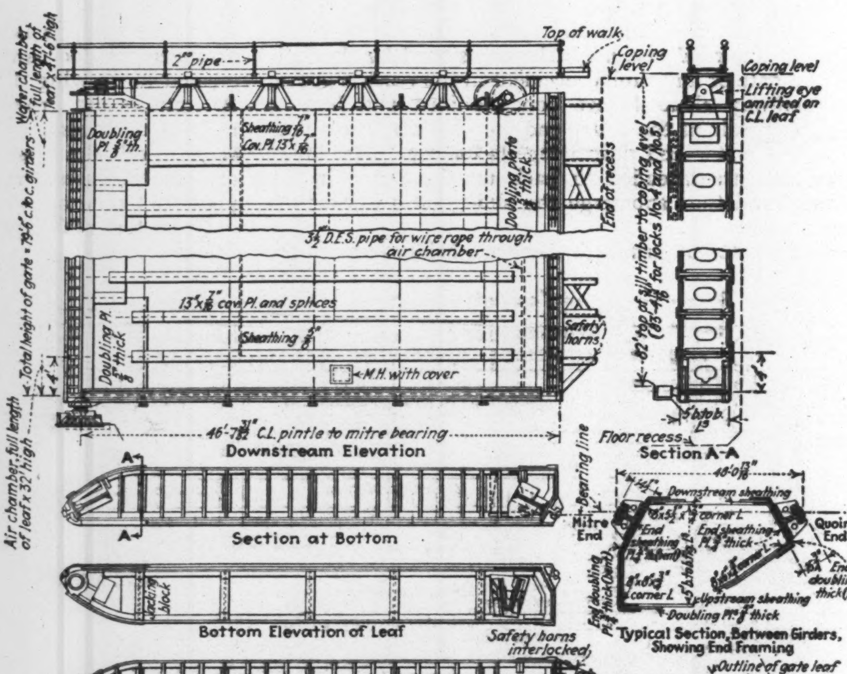

Water chamber full length of leaf x 21'-6" high
Total height of gate = 79'-6" c. to c. girders
Air chamber full length of leaf x 32' high
2" pipe
Top of walk
Coping level
Doubling Pl. 5/8" th.
Sheathing 7/16"
Cov. Pl. 13"x 7/16"
Doubling plate 3/4" thick
End of recess
3½" D.E.S. pipe for wire rope through air chamber
13"x 7/16" cov. Pl. and splices
Sheathing 5/8"
Doubling Pl. 5/8" thick
Safety horns
M.H. with cover
4'
46'-7 31/32" C.L. pintle to mitre bearing
Downstream Elevation
Coping level
Lifting eye omitted on C.L. leaf
82' top of sill timber to coping level (83'-4 1/16" for locks No. 4 and No. 5)
5' b. to b. L's
Floor recess
Section A-A
A
Section at Bottom
Bearing line
Jacking block
Bottom Elevation of Leaf
48'-0 13/16"
Downstream sheathing
8"x5½"x ¾" corner L
Mitre End
Quoin End
End sheathing Pl. ¾" thick (bent)
End sheathing Pl. ¾" thick
End doubling Pl. ¾" thick (bent)
8"x8"x ¾" corner L
Upstream sheathing
Doubling Pl's 5/8" thick
End doubling ¾" thick (bent)
Typical Section, Between Girders, Showing End Framing
Safety horns interlocked
Typical Section
Web reinf. 2 Pl's ¾" thick
Outline of gate leaf when mitered
Opposite leaf
Outline of recess Quoin End

FIG. 8—DETAILS OF THE LOWER LOCK GATES

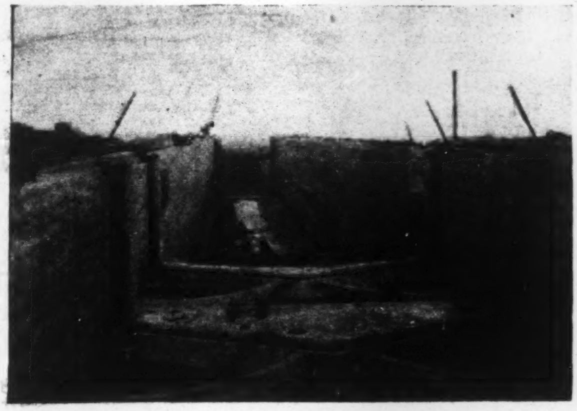


FIG. 9—UPPER LOCK CHAMBER OF ONE OF THE FLIGHT LOCKS

Sills and curved toe walls for the guard gate and service gate in the foreground and beyond the curved breastwall at the upper end of the chamber. The toe walls act as guides for the gate-operating cables. In the distance a crane is erecting one of the 82-ft. high service gates at the lower end of the lock. There is a guard gate at that end also.

amount of underwater rock excavation necessary in deepening the canal at some future date. As noted previously, a depth of 30 ft. over the lock sills has been provided, in order that the canal may be excavated to that depth without altering the locks.

The greater part of the canal is excavated through clay or other glacial residue in which hydraulic dredges were used to advantage, but at the southern or upper end, where the canal crosses the height of land near Port Colborne, much rock was encountered. The total amount of rock excavated for the entire canal was in the neighborhood of 9,000,000 cu.yd., and the earth excavation exceeded 50,000,000 cubic yards.

All earth slopes are protected by a concrete revetment extending from below the water line to well above the limit of possible wave action.

*Bridges*—In all there are 21 railway and highway bridges across the canal. They are of four general types, direct lift, single-leaf rolling bascule, double-leaf rolling bascule, and swing—the type depending upon the location of the bridge and the character of the traffic. The single-leaf rolling type is used for crossings which come at the narrow lock-approach channels, and the longer spans are used for the open-channel crossing.

*Chippawa Creek Siphon*—The most difficult problem of the whole undertaking was the construction of a siphon under the canal to carry Chippawa Creek. In the construction of the two earlier canals the canal was carried over the creek in an aqueduct of stone masonry but such a plan was not feasible with the deeper canal. Consequently, it was decided to carry the creek under the canal in an inverted siphon culvert.

At the site chosen for the new culvert, just north of the old aqueducts, rock lies at a depth of 100 ft. below the ground level. It is covered with a glacial clay. The first scheme called for carrying the culvert under the canal through this solid rock, but, as that would have required placing the bottom of the culvert 170 ft. below the surface, the scheme was abandoned in favor of a monolithic concrete culvert carried on piles in the clay at a depth just sufficient to clear the bottom of the canal. Details of the culvert are shown in Fig. 10, as is the method of maintaining traffic in the old canal. Steel sheetpiles 70 and 55 ft. long were used for the outer and inner walls of the cellular cofferdam, respectively.

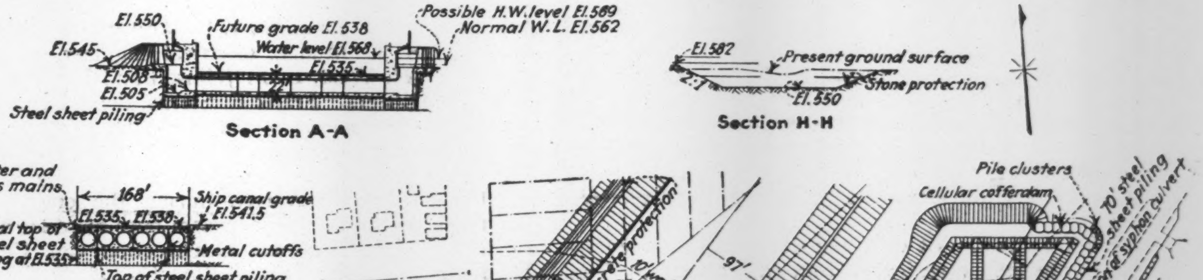

El. 550
Future grade El. 538
Possible H.W. level El. 569
Normal W.L. El. 562
El. 545
Water level El. 568
El. 535
El. 508
El. 505
22'
Steel sheet piling
Section A-A
El. 582
Present ground surface
2:1
El. 550
Stone protection
Section H-H
Water and gas mains
168'
Ship canal grade El. 541.5
El. 535
El. 538
Final top of steel sheet piling at El. 535
Metal cutoffs
Top of steel sheet piling cutoff at El. 504
Section B-B
Concrete protection
10' water mains
97'
Berm El. 563
B
B
A
A
244'6"
255'3"
180'8"
C.L. culvert
El. 550
El. 541.5
Berm El. 563
Steel sheet piling
H
H
Pump house
INTAKE CHANNEL
DISCHARGE CHANNEL
CHIPPAWA CREEK
Former channel
C.L. Welland ship canal
Present canal aqueduct
Old aqueduct
Former channel
Pile clusters
Cellular cofferdam
70' steel sheet piling
C.L. of syphon culvert
C.L. Welland ship canal
Course of boats during construction
Old aqueduct
Fender
Plan Showing Arrangement of Cofferdams
Plan

FIG. 10—SIPHON CULVERT FOR CHIPPAWA CREEK

Early in the operation it was realized that the greatest difficulty would be encountered in controlling the saturated clay through which the excavation had to be carried, and consequently the area was subdivided into pits, which were carried down to subgrade successively in such a way as to permit the construction of the vertical shafts and horizontal sections of the culvert in large units. An elaborate system of bracing for the walls of the pit was developed in the hope of taking care of the thrust of the surrounding clay, but even so, much difficulty was encountered in maintaining the cofferdam at the northeast corner where it projected out into the present canal, and in several instances 18x18-in. timbers failed under the great pressure which developed.

*Harbors*—The new harbor at Port Weller extends a mile and a half out into Lake Ontario between breakwaters which form a roadstead 800 ft. wide, except at the entrance, where it is narrowed down to 400 ft. The two breakwaters consist of earth embankments 200 ft. wide on top, with the outer ends protected by rock-filled reinforced-concrete cribs. The same type of crib also is used at the inner end of the harbor to provide dockage facilities. The cribs were built on wooden pontoons and towed to the site, where they were floated off the pontoons and sunk by opening seacocks in the concrete bottoms of the cribs.

The cribs were sunk to a prepared bed as close as possible to proper alignment, and then a true alignment for the top of the wall was obtained by capping them with poured-concrete coping blocks. This arrangement produced a true top for the wall and added to its strength.

The two embankments were made of excavated material brought down from the canal excavation on a railroad which the Department of Railways and Canals built along the route of the canal for use during the construction period. A certain quantity also consisted of dredged material from the harbor excavation.

At Port Colborne additional protection against the storms of Lake Erie was provided by extending the breakwaters. Here, because the exposure was greater than at Port Weller, concrete cribwork was adopted for all of the new work, and rock was used for the filling and for protection along the outer side of the breakwater.

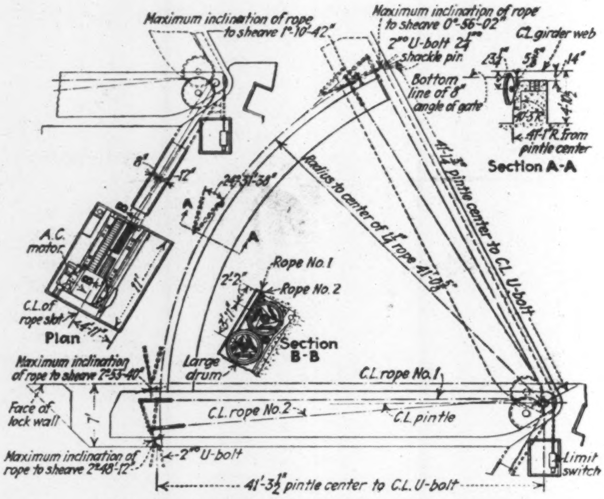

Maximum inclination of rope to sheave 1°-10'-42"
Maximum inclination of rope to sheave 0°-56'-02"
2" U-bolt 2 1/4" shackle pin
C.L. girder web
2 3/4"
5 5/8"
14"
Bottom line of 8" angle of gate
10.5 R.
41'-1" R. from pintle center
Section A-A
8"
12"
24°-31'-38"
A
A
B
B
A.C. motor
11'
C.L. of rope slot
4'-11"
Plan
Radius to center of 1 1/4" rope 41'-0 5/8"
41'-1 5/8" pintle center to C.L. U-bolt
Rope No. 1
Rope No. 2
2'-2"
3'-11"
Section B-B
Large drum
Maximum inclination of rope to sheave 2°-53'-40"
Face of lock wall
7'
C.L. rope No. 1
C.L. rope No. 2
C.L. pintle
Maximum inclination of rope to sheave 2°-48'-12"
2" U-bolt
Limit switch
41'-3 1/2" pintle center to C.L. U-bolt

FIG. 11—GATE-OPERATING MECHANISM

*Lock Operation*—At each end of all locks the equipment is operated electrically from control houses from which the operators can see the entire lock. The control boards are equipped with signals to advise at all times as to condition of all apparatus under the operator's control. Provision has been made for controlling the operations locally in an emergency and for manual operation. Alternating current at 550 volts is used for the motor equipment.

*Engineers and Contractors*—Construction of the canal has been carried on by the Department of Railways and Canals of the Dominion of Canada, of which A. E. Dubuc is chief engineer. When the work was first started, J. L. Weller was placed in direct supervision of the work as engineer-in-charge. In 1919 he was succeeded by Alex J. Grant as engineer in charge and Mr. Grant has carried the work through to the present time. Assisting Mr. Grant are E. G. Cameron as his principal assistant; Frank E. Sterns, designing engineer; M. B. Atkinson, bridge engineer; J. B. McAndrew, mechanical engineer; A. L. Mudge, electrical engineer, and F. C. Jewett, C. W. West, E. P. Johnson and E. P. Murphy, division engineers. Frank E. Sterns, the designing engineer, previously served as one of the designing engineers of the Panama Canal.

Numerous contracts were let for the many kinds of construction work involved during the entire period from 1913 to date. The principal ones were let to J. P. Porter, P. Lyall & Sons Construction Co., Canadian Dredging Co., Atlas Construction Co., E. O. Leahey & Co., and A. W. Robertson, Ltd. The gates were built by the Steel Gates Co. and the bridge superstructures by the Hamilton Bridge Co., the Canadian Bridge Co. and the Dominion Bridge Co.

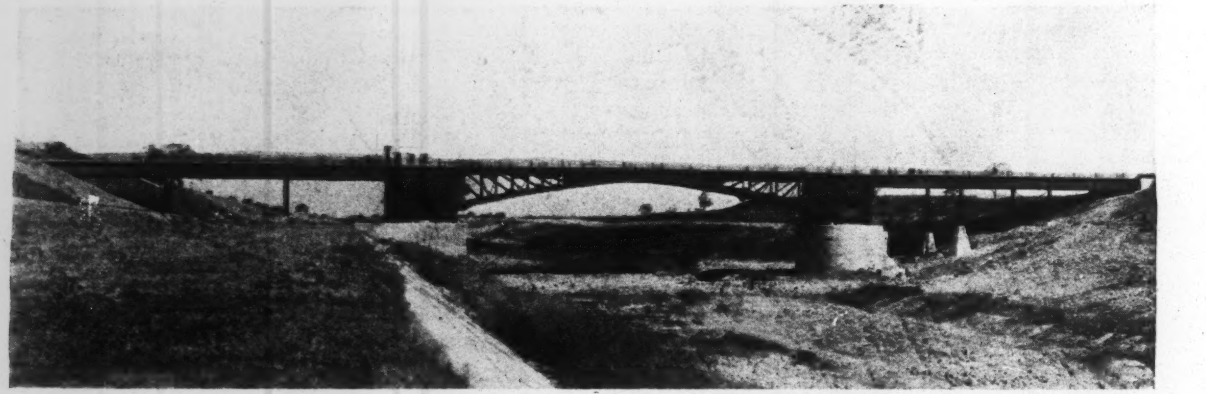


FIG. 12—BASCULE BRIDGE FOR THE HAMILTON-QUEENSTON HIGHWAY CROSSING

When this picture was taken the channel was completed except for the final trimming of the canal prison and the concrete revetment below bridge at the right. All slopes are to be sodded as at the left and trees are being planted wherever possible.

# Deep Foundations at Cleveland Union Station

## Tower Supported on Concrete Piers in Wells Sunk 200 Ft. to Rock—Bearing Tests and Settlement —Cost $1.25 Per Cubic Foot

EXTENSIVE STUDY of subsoil and foundation conditions at the site of the new union terminal at Cleveland, Ohio, necessary because of the large loads to be supported on deep clay strata, led to the sinking of remarkably deep piers 200 ft. to rock, for the columns carrying the 52-story tower and some other heavily loaded columns. Other column foundations are on clay. At the recent Cleveland meeting of the American Society of Civil Engineers, C. P. Marsh, engineer of structures for the Cleveland Union Terminals Co., reviewed the design of these foundations in an elaborate paper. The following are brief notes:

*Foundation Conditions*—To explore the subsoil 95 bore holes were driven, aggregating about 8,000 lin.ft. The underlying clayey material was found to contain 19 per cent of fine sand (grains 0.1 to 0.05 mm. in diameter), 67.2 per cent silt (0.05 to 0.005 mm.) and 13 per cent clay (smaller than 0.005 mm.). Load tests were made with a box of 1-cu.ft. capacity in which material from the borings was loaded by a 4-in. square plunger and weighted lever. A field test on the exposed stratum was also made with a plunger 3 ft. square supporting a platform 12x12 ft. loaded with pig iron. Here the settlement was 0.27 in. and 1.2 in. under loads of 3 and 7 tons per square foot, respectively, while on removal of the load the plunger rose 0.4 in. or one-third of the maximum settlement. Tests with a $1\frac{5}{8}$-in. steel ball dropping 24 in. upon slabs of the clay indicated a shearing strength of 1,800 lb. per square foot and an angle of internal friction of $7\frac{1}{2}$ deg. On the basis of the various tests, a maximum bearing pressure of 3 tons per square foot was adopted for the design of retaining walls and spread footings. Helpful information in these studies was obtained from a paper by Arthur L. Bell on the supporting power of clay foundations, in the *Minutes of Proceedings*, Institution of Civil Engineers (London), Vol. 199, Part I, 1914-15.

*Concrete Piers*—For the 52-story tower a preliminary design of mat foundation with a soil load of 3 tons per square foot gave prohibitive size and cost. Attention was then directed to the Chicago system of cylindrical piers built in open wells or shafts sunk to rock or hardpan. Borings at the site showed sand and sandy clay for about 42 ft., then strata of moist and compact blue clay with a little sand for about 110 ft., and dry, hard, tough clay for about 87 ft., followed by 4 ft. of similar clay with granite boulders. Below this a 37-ft. core of shale rock was taken out. Tests of the rock gave a pressure equivalent to 316 tons per square foot before cracking, and a safe load of 100 tons was assumed. The overlying clay was dense, averaging 133 lb. per cubic foot, but was in strata of different quality, some moist and plastic, others dry and hard. The tall tower imposes a heavy load on an area 100 ft. square, which load is carried by sixteen columns. Piers sunk to rock were finally adopted for the tower.

In connection with skin friction value in piers not sunk to rock, study was made of tests made at the Chicago union station (see *Engineering News-Record*, May 18, 1922, p. 822). It was finally decided to use for bearing pressure on clay a load equal to 110 times the depth in feet of the soil above the bottom of the foundation, plus 3,000 lb. when skin friction is considered, and with a maximum bearing pressure of 15,000 lb. when skin friction is ignored.

As the cost of excavation amounts to about as much as that of concrete, there is economy in adding cement to make a rich concrete. A concrete mix of 1 : 1 : 2 was adopted with a unit stress of 750 lb. on concrete not reinforced and 1,000 lb. under the steel billets of the column bases, where the pier top is reinforced by hooping and vertical bars.

The tower piers were carried down to rock by the open well system. The wells were sunk in 6-ft. lifts, lined with hardwood staves and steel ring braces. These piers, 8 ft. 8 in. to 10 ft. 4 in. in diameter, are about 204 ft. deep and carry loads varying from 6,300,000 to 8,900,000 lb.

The piers for the building itself, outside of the tower, are seated in the clay and have belled-out bases (sides of cone sloping 2 on 1, down to a cylindrical base 12 in. thick); these piers are 4 ft. to 7 ft. 2 in. in diameter. The soil was not considered satisfactory for belling if samples tested by a $1\frac{5}{8}$-in. steel ball dropping 24 in. gave an imprint exceeding 1.03 in.

Of numerous deep well foundations for other buildings in the station area, the largest, under the Medical Arts Building, is 11 ft. 7 in. in diameter, founded on bedrock and carrying a load of 11,300,000 lb.

An opportunity to examine the quality of the concrete was given when a decision to carry a completed column to a deeper level necessitated cutting through the first bell. This concrete, which proved to be dense, compact and very hard to cut, had been dropped 70 ft. through the air. This method of placing concrete is usual in such work.

Gas was encountered in practically all the wells and one explosion occurred, burning men at the top of the well.

These foundations, supporting about 1,000 columns, contain 74,000 cu.yd. of concrete and 3,100 tons of reinforcing steel. They cost about $1.25 per cubic foot.

*Earth Subsidence*—A general subsidence of the earth over a restricted area adjacent to the work during the construction of the deep well foundations is attributed largely to the lateral flow of the clay strata at the wells, due to the clearance outside the lagging and to the yielding of the lagging under stress. This subsidence, with a maximum of several inches, bore a definite relation to the positions and depths of the wells. That the line of decided break at the surface is at a horizontal distance equal to half the depth of excavation has been stated by H. C. Moulton in a paper on "Earth and Rock Pressures" (*Transactions*, American Institute of Mining and Metallurgical Engineers, 1920, Vol. LXIII), and Mr. Marsh states that a study of conditions at the Cleveland station appears to support this opinion.

In spread footings, used wherever possible on account of cost and speed of construction, the allowable pressure on the soil was fixed at 6,000 lb. per square foot. The largest of these footings is 32x41 ft. and carries a load of 6,300,000 lb. Settlement was about the same as in the piers founded on clay.

All design and construction was under the direction of H. D. Jouett, chief engineer and terminal manager, Cleveland Union Terminals Co. Spencer, White & Prentis, Detroit, were the foundation contractors.

# Geophysical Study Predicts Rock Conditions at Tunnel Site

## Field Measurements of Electrical Resistivity Show Extent of Fractured Zone on Line of Bridge River Bore

By E. E. Carpenter
*Consulting Engineer, British Columbia Electric Railway Co., Ltd., Vancouver, B. C.*
*and* E. G. Leonardon
*Schlumberger Electrical Prospecting Methods, New York City*

UNDERGROUND conditions at the sites of certain engineering works, especially dams and tunnels, affect construction methods and costs to such an extent that advance information in regard to rock formation and water conditions is of the utmost value. Lack of such knowledge sometimes results seriously; witness the Tanna and Moffat tunnels and the San Gabriel dam, cited in an editorial on the subject in *Engineering News-Record*, Feb. 27, 1930, p. 348. Drilling is the generally accepted method of underground exploration. The expense of this work, and the fact that it yields only extremely local data, is the reason why, at times, even large construction jobs have been started after only surface study of geological conditions. Such a course is now unnecessary, for a geophysical method is available which supplements either surface examination or drilling, yielding much more extensive data on conditions over a larger area.

No attempt is made in this article to detail the technique of the geophysical exploration, but proper understanding of the method requires a brief explanation of the theory of rock resistivity upon which it is based.

### *Principles of Resistivity*

The unit of electrical resistivity is the resistance of a cylinder of material having for height the unit of length and for section the unit of surface, usually expressed in ohms per meter-meter square. With the exception of a certain number of metallic ores which have the property of electronic conductivity (conducting the electrical current-like metals), rocks are capable of transmitting the electrical current only by means of the water contained. Their conductivity is, therefore, electrolytic and disappears entirely when they are perfectly dry. The solid mineral elements are almost perfect insulators which the current skirts, following the damp veins. From this it follows that the resistivity of a rock is proportional to the quantity of water contained and, roughly, inversely proportional to the total quantity of ionized salts. If the material is of a very compact type, the amount of moisture it contains is exceedingly small and its specific resistances, therefore, considerable. This is the case of rocks like granite, gneiss, marble, and in general, all metamorphosed or very compact rocks where only a limited proportion of open spaces or pores exist. On the other hand, materials with a high water content, like clay, marl, soft limestone, shattered zones and wet faults show good electrolytic conductivity.

These differences in the conductivities of the rocks are well characterized by some figures. Clays and unconsolidated clayey formations often possess resistivities as low as 10 to 30 ohms; clayey-calcareous soft terrains show corresponding figures between 20 and 400 ohms; eruptive or metamorphic masses may have resistivities ranging from 200 to 2,000 ohms and up, according to their lack of porosity. As to the sands, their resistivities will vary greatly according to their dryness and to the impurities contained therein (clay or organic matter). Very pure siliceous sands may be quite resistive, since the absorbed water contains a very small percentage of dissolved salts.

An excellent example of the results which can be obtained by electrical prospecting was provided at the 13,200-ft. Bridge River tunnel recently completed by the British Columbia Electric Railway Co. It is located at Bridge River Station, B. C., along the line of the Pacific Great Eastern Railway, which runs from Squamish to Lilloet.

### *Exploration at Bridge River Tunnel*

In the summer of 1928 the tunnel had been commenced at both ends and was, at that time, approximately in the state shown in Fig. 1. At the northern end the rocks tilted at an angle of about 45 deg. towards the south, while at the southern end conditions were just the reverse (rocks tilted at about 45 deg. northwards). The same rocks outcrop on either slope of the mountain, but in the opposite order, thus showing quite plainly that they constitute two limbs of a large syncline. At both ends the tunneling work was begun in sheared greenstone. This rock is largely constituted of altered and serpentinized andesite and contains numerous fissures but does not contain a great amount of water and is quite firm.

No special difficulty was encountered at the northern end, and the work proceeded satisfactorily. This was not the case, however, at the southern end, where a decided change appeared in the material encountered at a point 1,020 ft. from the entrance. The rock became much softer and more fractured, and at the same time some small water occurrences were encountered. At 1,220 ft. a strong flow of water was discovered which invaded the tunnel under heavy pressure, causing crushing of the heavy timbering and a complete collapse over a length of more than 200 ft. As a result, the end of the clogged drift had to be abandoned and a new line II (see Fig. 2) was chosen for the resumption of the tunneling work.

It was at this point, at the commencement of this new work, that electrical prospecting was called in to obtain a general perspective of the rock conditions on the south side of the syncline. A study by resistivities was undertaken, the results of which are summarized in Fig. 2. Three resistivity profiles were traced at the surface along alignments I, II and III. Cross-sections I, II and III demonstrate the resistivities obtained. The lighter shade represents resistivities lower than 400 ohms; the medium one indicates resistivities computed between 400 and 700, and the darker one corresponds to resistivities of 700 ohms and up. With the aid of these data and taking into consideration the average dip of the rocks in the area, it was then possible to forecast what conditions would be encountered along line II, on which

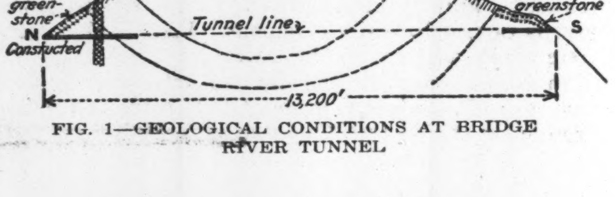

Quartz-diorite dike encountered by the tunnel
Sheared siliceous beds alternating with layers of schists
Silicified greenstone and limestone
Sheared greenstone
Sheared green-stone
N
Constucted
Tunnel line
S
13,200'

FIG. 1—GEOLOGICAL CONDITIONS AT BRIDGE RIVER TUNNEL

the tunneling work was resumed. These conditions were presented as follows in the geophysical report submitted to the British Columbia Electric Railway Co., Ltd., in September, 1928:

> For a length of 370 ft. (approximately from point 1,190 to point 1,560) the drift will cross a bed of particularly soft material. A bed of harder rock will then be encountered from point 1,560 to point 1,730, but it is not until point 1,730 that conditions similar to those encountered before point 1,020 can be expected.

On Fig. 2 the constitution of the rocks actually encountered along the tunnel, which have been bored through since, has been indicated. The accuracy of the results obtained by examination of the resistivities of the rocks and their mechanical properties is evident.

The technique of resistivity measurements is not confined to the study of the electrical characteristics of the rocks from the surface, as was the case at Bridge River. Similar measurements can also be taken inside drill holes, permitting detailed electrical study for the entire depth of the hole. Measurements of resistivity in a drill hole supplement the data obtained by examination of the samples of rocks obtained by drilling. By this procedure an idea is obtained of the conductivity of the rocks at the different depths. This may, to a considerable extent, enable the engineer to decide whether or not the rocks are dry and compact or loose, wet material, especially since a certain amount of information is already available from the drill log. The objection may be raised that conditions underground are already known from samples obtained in the course of the drilling and that the electrical measurements will provide but very little new information. This, however, is scarcely true, since very often it is not possible to secure complete cores from the hole drilled. Core drilling is the most expensive of all systems of drilling and is seldom employed. In most drilling procedures samples of the terrains traversed are obtained in the form of minute particles, from which it is not always possible to determine the average resistivity of a considerable spherical block. Electrical measurements give a value which may take in a very large volume; in other words, the method is concerned not merely with rock characteristics in the immediate neighborhood of the drill hole, but may study a vertical column, the section of which may be chosen and varied according to the circumstances. This property of electrical coring of enabling the study of large volumes of ground is very important, since it very nicely supplements the precise but local information obtained from the drill holes.

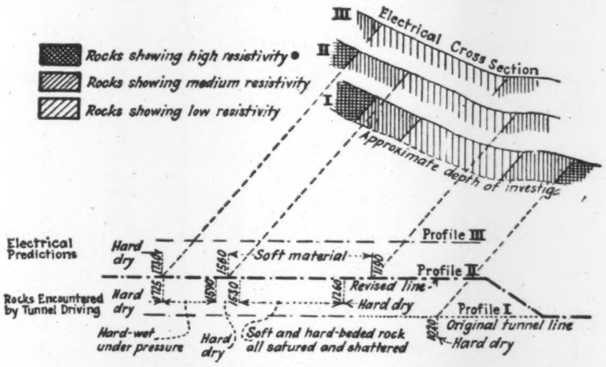


FIG. 2—ANALYSIS OF CONDITIONS AT SOUTH END OF TUNNEL

Cross-hatched areas show formations as predicted by electrical means; lower line conditions actually found on line II.

# The Editor Afield

## —In the Dakotas and Wyoming

### Modern Improvements a Feature of Many Western Municipalities—Water Resources of States Now Under Study

NATURAL gas lines from the Baker field in eastern Montana are invading North Dakota and eventually will be extended to the Twin Cities. A line has been completed as far east as Bismarck. Natural gas is being used as fuel in the steam-generating plant at Williston, N. D., operated by the Montana-Dakota Power Co.

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Bismarck is a neat little city located in the most open of the great open spaces on the banks of the Missouri. A paving program completed last year by the city would be a credit to a town twice its size. The old river serves both as a source of water supply and a sewage-disposal system.

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Pierre, with paved streets, garages, filling stations and a new steel bridge across the Missouri River, presents a vastly different picture than was to be seen twenty years ago. Then the streets were mud holes, livery stables dominated all the busy corners, and one had to cross the river on a ferry.

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Rapid City, nestled at the foot of the Black Hills, has gone modern to the limit. They even have daylight saving, very unusual for the West. And not one native pointed out the Hangman's Tree. Maybe they are trying to forget the old cattle-rustling days.

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The Homestake Gold Mining Co. is a little world by itself. The company owns practically all of the city of Lead, operates one of the largest gold-mining properties in the world, owns and operates timber lands, has its own water-supply system and operates its own hydro-electric power plants. The city of Lead is suffering the fate of Scranton, Pa., and other mining communities. Parts of the town are sinking into old abandoned mine workings. Even the main street is settling to such an extent that a proposed paving program has been abandoned.

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Cheyenne, Wyo., is a pleasant surprise. The former dusty and dirty town of the plains is now a clean, attractive, well-paved little city. Seen in the height of its glory—during Frontier Days—it presented a pleasing picture. Cheyenne has just completed the North Crow dam, which will provide 2,800 acre-ft. of additional storage for the city's water supply. Located 35 miles west of town, the dam is a rolled-fill earth structure 87 ft. high and 670 ft. long, containing 160,000 cu.yd. of material. A. H. Read of Cheyenne was contractor. P. R. Revis, city engineer, supervised the construction. The dam cost $225,000.

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Governor Frank Emerson, of Wyoming, former state engineer, represented his state at a meeting in Denver late in July at which the upper four states in the Colorado River basin, Wyoming, Colorado, Utah and Nevada, made plans for a four-state pact supplemental to the Boulder Canyon dam agreement. Each of the states will determine its water needs and water resources in detail, to be presented at another meeting to be held in Denver.

# Corrugated Steel Shells in Bored Holes Form New Type Pier Foundations on P.R.R. Bridge

### Novel Method of Sinking Wells 80 Ft. Deep Through Meadow Muck Used for West Approach Piers of Passenger-Line Crossing Over Hackensack River

COMBINATION open and pneumatic corrugated steel shells 48 in. and 54 in. in diameter sunk 80 ft. deep in bored holes belled out to 11 ft. and 12 ft. 3 in. diameter at the bottom, in the Hackensack meadows muck form the pier foundations for the west approach of the Pennsylvania Railroad's new passenger-line crossing under construction over the Hackensack River between Jersey City and Kearny, N. J. The new type foundations are used on eight piers of the approach structure, six of the piers resting on eight 48-in. wells and two on ten 54-in. wells, all belled out in hardpan at the bottom. Fig. 2 shows the design of the piers and the foundations. The corrugated steel walls of the shells are put down as casings in holes bored with a special type of auger and jet, which removes none of the core but leaves a heavy liquid mud in the wells that keeps the sides from caving in. Details of the shaft are shown in Fig. 4.

The maximum compression on the concrete of the 48-in. cylinders is about 325 lb. per square inch, and these cylinders are heavily reinforced with 1-in. vertical bars, fastened together with $\frac{1}{2}$-in. hoops. The pressure on the hardpan is approximately 6 tons per square foot, which, in depths of 75 to 80 ft., is amply safe.

In general, the process consists of the following steps: (1) boring the hole to hardpan, leaving a semi-liquid core; (2) sinking a corrugated steel casing to the bottom; (3) dredging out the hole by means of well buckets and clamshells; (4) putting air on the shell to permit belling out the bottom of the hole in hardpan; (5) concreting the caisson under air; (6) putting a concrete mat over the cluster of wells at ground level to form the pier base.

*Boring the Wells*—A three- or four-blade auger, as shown in Fig. 5, bores a hole 1 in. larger than the casing to be used. The auger is handled by a special self-propelling drilling machine weighing 20 tons, mounted on crawler treads and operated by a 140-hp. gasoline engine (Fig. 1). Extra heavy 10-in. steel pipe, in 12-ft. sections, with bolted flange connections, is used for the drive shaft of the auger. A special key section of pipe is always used as the top section, fitting into the driving mechanism of the machine. It was found that the terrific torsion developed in the auger pipe when hard drilling was encountered was forcing the screw end of the flange connections into the pipe, causing distortion. This was remedied by welding the flanges to the pipe after they were screwed into place.

The combination of the auger motion and jet action of water forced down through the pipe line leaves the hole filled with a liquid mud as the auger works downward. To prevent washing much of this material out of the hole, the amount of water used is controlled. Of course, some of the mud and water overflows, but this is collected in a sump, screened and allowed to settle and then pumped back through the auger jet. A combination valve on the pump intake permits the use of this muddy water or fresh water, whichever is needed to keep the bored core in the desired solution.

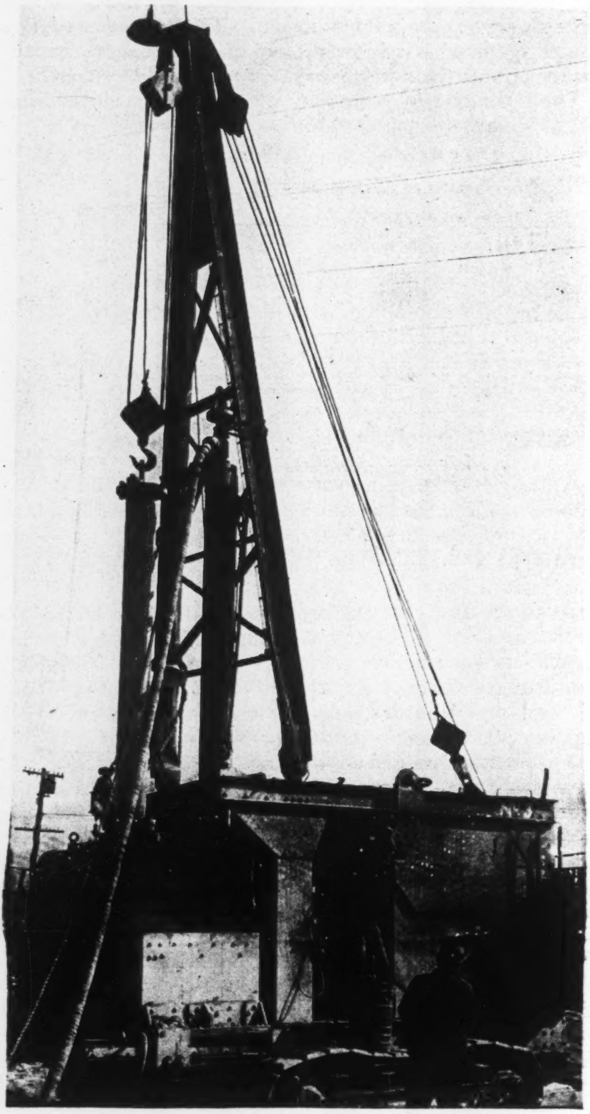

FIG. 1—DRILLING MACHINE FOR BORING HOLES FOR NEW TYPE OF PIER FOUNDATION
Key section of drive pipe can be seen hanging to bracing of crane boom.

When the auger strikes hardpan, it is withdrawn and the hole is ready for the casing. As long as the liquid mud remains in the hole there is no collapse or slumping of the sidewalls. One hole remained open six weeks before the casing was put down. The weight of the drilling machine straddling the hole is a good test of the well's stability against caving in. The average speed obtained in drilling was two holes in one 9-hour shift.

*Placing Casing*—Twelve-gage corrugated culvert pipe in 22-ft. lengths was used for the casings. Connections between sections are made by a corrugated iron band 24 in. wide bolted tight through lugs, the strength of the connections depending upon the shear resistance of the corrugations of both the pipe and band. The pipe sections are handled by a crawler crane (Fig. 3) and are worked downward into place, sometimes dropping easily and again requiring additional load on top and considerable persuasion. When a new section of pipe is to be added, the casing in the well is held by a crossbar through holes punched in the pipe.

*Excavation*—After the casing had landed on the bottom, much of the material within the shell was removed by well buckets. These buckets, of 1-cu.yd. capacity and equipped with foot valves, were able to excavate down to heavy mud in the bottom of the wells. Small orange-peel buckets then took out the remaining mud down to hardpan. When hardpan was reached, it was necessary to put air on the shells for the bell excavation.

The adapter or diaphragm plate carrying the air-lock was fastened to the shell by twelve 1-in. hook bolts. These bolts and the top end of the shell were encased in a heavy concrete collar. Two I-beams were placed across the top of tie collar, upon which was piled about 28 tons of weights to resist uplift of the shafts under an air pressure of 33 lb. per square inch. After the air was put on, all joints in the casings were caulked, which made the shell remarkably tight.

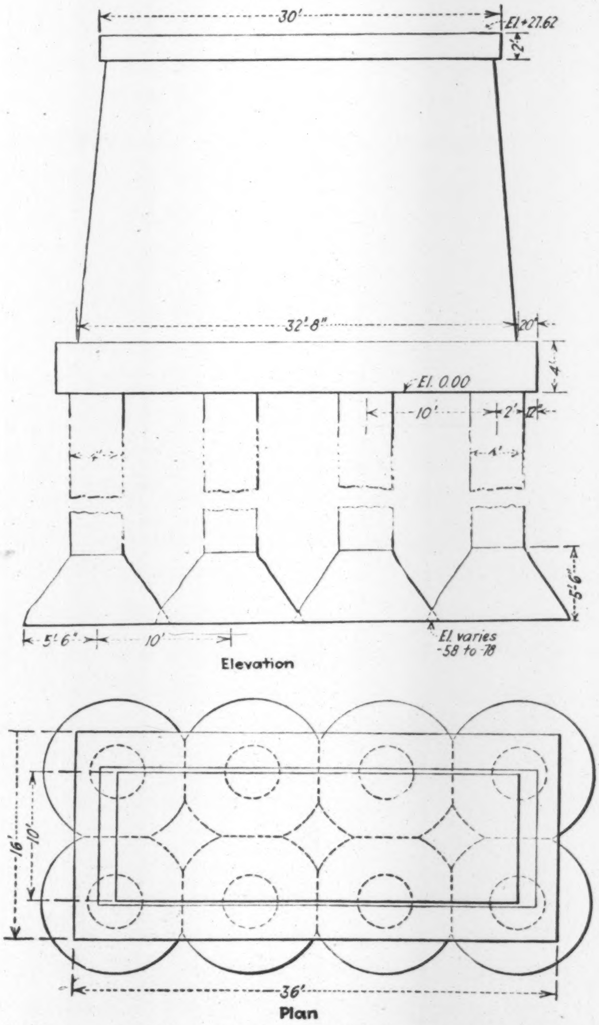

FIG. 2—DETAIL OF PIERS SHOWING ARRANGEMENT OF FOUNDATIONS

**Six of the eight piers are as shown here. Two piers are founded on ten shafts, the longitudinal spacing being 11 ft. 6 in. and the transverse spacing 12 ft. 3 in.**

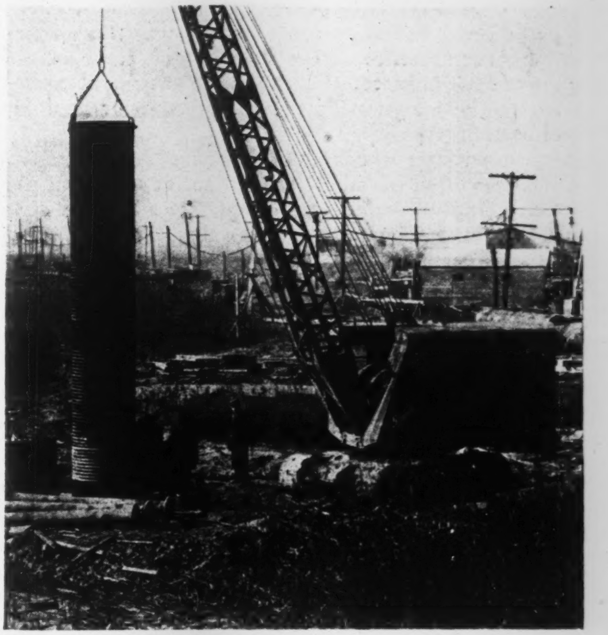

FIG. 3—PLACING CORRUGATED STEEL SHELL IN ONE OF THE BORED HOLES

The holes were belled out in the hardpan to established depths by two laborers using pneumatic spades. The 48-in. shafts were belled out at the bottom of the shell to a diameter of 11 ft. with a depth of bell of 5½ ft. On the 54-in. shafts, the diameter of the bottom of the bell was 12 ft. 3 in. and the depth of bell about 6 ft. The elevation of the bottom of the bells is substantially the same in each pier, placing the bottoms of all the holes for one pier on a horizontal plane. To carry each shaft to this predetermined level, it was necessary in some cases to cut off the bottom of the shell with an oxy-acetylene torch when the shell was too deep or to extend the bottom of the shell several feet lower when it was too high.

The material encountered in excavating was black river muck, fine sand, and clay in various strata, the bottom being in a hardpan conglomerate of sand, clay, gravel and boulders up to 2 ft. or more in diameter, which was part of the glacial morain which underlies the sand and clay of comparatively recent formation, and overlies the red shale rock which occurred from 30 to 40 ft. below.

The strength of the steel casings to resist pressure was notable, and in none of the shells was the 48-in. diameter distorted more than 1 in.

Original plans did not contemplate the use of air, and attempts were made at first to seal the outside of the casing to prevent water and mud from flowing into the bell excavation by injecting cement grout around the outside of the casing at a considerable depth. This, however, caused the casing to collapse, in several cases to a considerable extent, on account of the unequal pressure from the grout which was as high as 100 lb. per square inch. Considerable difficulty was encountered in chiseling and burning out the collapsed sections of casing, and operating the gas cutting torch under compressed air proved to be very dangerous. After the collapsed sections had been cut out, vertical lagging was placed outside the circumference of the shell so that the concrete section was not reduced. Failure in the attempt at grouting led to the adoption of the compressed air method, as has been described.

A crew of three sandhogs worked at a time under air, two at the bottom of the hole and one remaining in the airlock to transmit signals to the outside. Signals were given by the men at the bottom of the hole by tapping on the steel cable carrying the bucket. Rope safety ladders were used inside the shells. An air hoist was used to handle the muck buckets.

*Concreting*—A special concrete lock replaced the regular lock for the concrete operations, as shown in Fig. 6. As the shafts and bells are heavily reinforced, it was necessary to hang the 30-ft. bars in bundles within the shaft before the airlock was set. The amount of concrete placed under air in each shaft varied from sealing the bells to filling the shaft to within 25 ft. of the top. The concrete was dumped from the lock without the use of chutes or pipes. Before the upper part of the shaft was concreted, the airlock was removed and hoop reinforcing cages were placed in the top section. Concreting was resumed under normal air pressure after a delay of but one hour, providing a monolithic shaft. A 4-ft. concrete mat placed at ground level over each cluster of shafts formed the bases of the concrete piers.

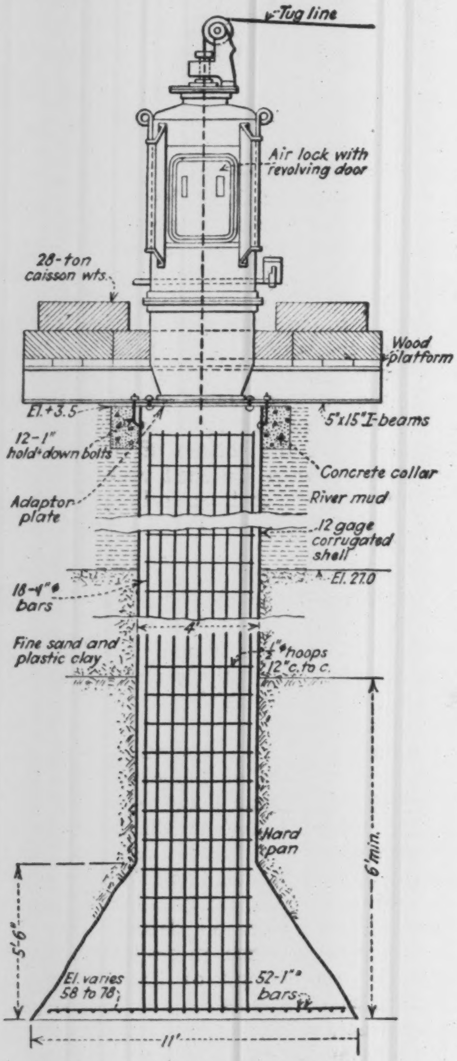
Tug line
Air lock with revolving door
28-ton caisson wts.
Wood platform
El. +3.5
5"x15" I-beams
12-1" hold-down bolts
Concrete collar
Adaptor plate
River mud
12 gage corrugated shell
El. 27.0
18-1" ⌀ bars
4'
Fine sand and plastic clay
½" ⌀ hoops 12" c. to c.
Hard pan
6' min.
5'-6"
El. varies 58 to 78
52-1" ⌀ bars
11'

FIG. 4—DETAIL OF SHAFT

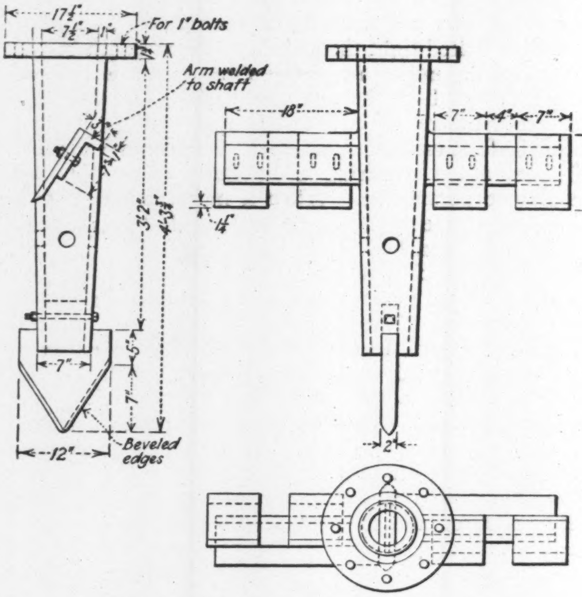
17½"
7½"
1"
For 1" bolts
Arm welded to shaft
3'-2"
4'-3⅜"
5"
7"
7"
12"
Beveled edges
18"
7"
4"
7"
12"
1¼"
2"

FIG. 5—DETAIL OF BORING AUGER

Three full diesel-driven compressors supplied the air for the caissons and spades. Although but few sandhogs were required on the work, a modern, high-pressure hospital lock was provided, as the air pressure required for belling-out was close to the full hydrostatic head, in most cases 32½ lb.

*Personnel*—Charles Scott Landers, New York, is consulting engineer for the Pennsylvania Railroad on the foundations. The bridge is being built under the direction of A. C. Watson, chief engineer, T. W. Pinard, engineer of bridges and buildings, New York zone, and J. J. Vail, construction engineer. Senior & Palmer, Inc., New York, is the contractor on the west approach, with James F. Armstrong as superintendent. The process of sinking the caissons was developed and patented by Charles L. Powell, president of the Caisson Construction Company of America, Chicago and New York. Mr. Powell supervised the sinking of the caissons on this job.

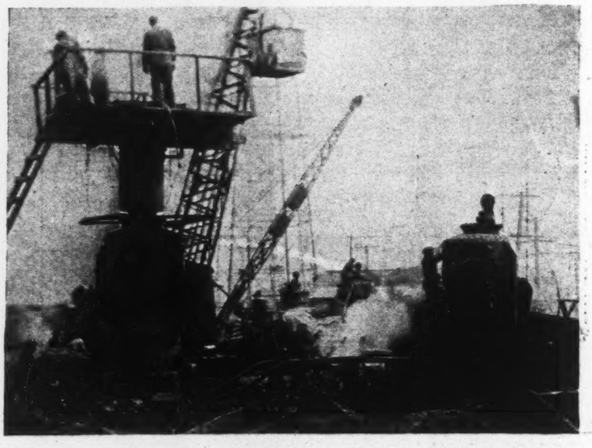

FIG. 6—VIEW OF CONCRETE AND MUCK LOCKS ON SHELLS
Concrete lock shown at left.

# Crane Runway Columns Reviewed

By Robins Fleming
*American Bridge Co., New York City*

THE UNUSUAL case of the girders of a crane runway loaded with two 40-ton cranes carried on column brackets came to the attention of the writer in a design recently handed to him for estimating. Occasion was thus given to review the subject of crane runway columns. In this particular instance, the reaction from the girders on the bracket was 200,000 lb., but the same considerations are involved as if the load were but 10,000 lb.

The Carnegie "Pocket Companion" illustrates a crane girder carried on a column bracket and a method for determining the fiber stress in the column due to the crane load. A number of handbooks and textbooks present the same method. As has been stated many times the method is erroneous.

Assuming the column hinged at top and bottom, the stresses are statically determinate. In Fig. 1A, $Wx = Hl$, from which $H = Wx/l$. The bending moment at $A$ equals $(Wx/l)a$ and at $B$ equals $(Wx/l)d$. The bending moment diagram for ends hinged is shown by Fig. 1B. From the basic equation $f = MI/n$, the fiber stress due to bending can easily be determined. The intensity of direct stress is the crane load divided by the sectional area of the column. The sum of the two is the intensity of stress in the outer fibers of the column.

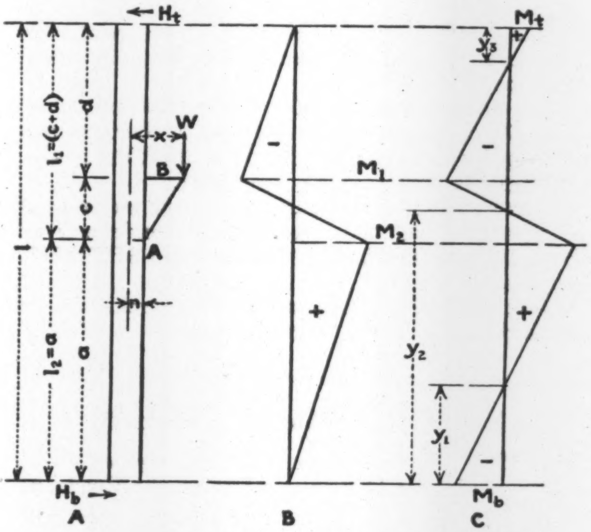

FIG. 1—BENDING MOMENT DIAGRAMS FOR CRANE COLUMNS

*A* shows the dimensions of the column; *B* the moment diagram for hinged ends and *C* the moment diagram for ends fixed.

The method of obtaining stresses with ends considered fixed is quite abstruse, although the equations necessary and a table giving results were published by the writer in *Engineering Record*, Sept. 2, 1916, p. 296. The bending moment diagram for ends so considered is shown by Fig. 1C.

A formula for columns considered hinged at the base and fixed at the top is given by Ketchum in his "Steel Mill Buildings" (4th edition, p. 108).

One of the important considerations in designing for eccentric loads involves the assumption made as to how the ends of the columns are to be considered. An effort usually is made to fix the columns at the base by set anchor bolts and at the top by rigid attachment to the truss. Neither object is fully attained. If the nuts of anchor bolts rest on angles fastened to the column a foot or so above the baseplate with stiffeners between angle and baseplates, the column will be more nearly fixed at the bottom than if anchor bolts extended through the baseplate alone. If kneebraces are used or the truss has a depth at the heel that will allow it to be framed into the column, much greater rigidity will be secured than if the truss rested on the top of the column.

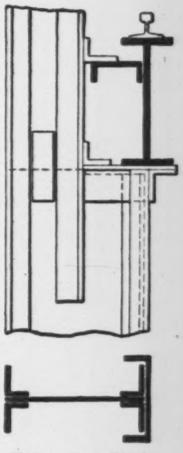

FIG. 2 — SUGGESTED DESIGN

**Brackets unsatisfactory for loads over 10 tons.**

It is the practice of the writer in determining bending stresses from crane girders resting on brackets to consider the ends of the columns to be hinged. If the columns were well secured at the ends in the ways mentioned, he has at times assumed the bending moment to be $\frac{8}{10}$ or $\frac{9}{10}$ of that obtained from ends considered hinged. It may be noted that the maximum crane load comes upon one bracket at a time. With a continuous system of bracing in the bottom chord of the trusses the thrust at the top of the loaded column will be distributed among several columns.

With stresses determined, the problem of proportioning material in the column must be met. The American Railway Engineering Association in its 1929 specifications for steel bridges specifies that, "members subject to both axial and bending stresses shall be proportioned so that the combined fiber stresses shall not exceed the specified axial unit stresses." The writer does not hesitate to follow this conventional method.

To return to the crane bracket carrying a load of 200,000 lb.: in the first place, such a load should not be carried on a bracket. The uncertainty of column end conditions becomes a far more serious matter than with cranes of one-fifth this capacity. The writer, when free to do so, restricts the use of cantilever brackets to cranes of 10 tons capacity or less. Ketchum in his specifications for steel-frame buildings says, "Crane girders carrying heavy cranes shall be carried on independent columns." Separate columns possess the advantage of having determinate stresses. If, however, columns were made as shown in Fig. 2, there usually would be a saving of steel, and the greater width would add lateral stiffness. This type of column affords an opportunity for effective longitudinal kneebracing where wanted. The inner flange can be made of sufficient sectional area to take any desired load. For an abnormally large load an I-beam can be used in place of the channel shown, although in such cases it might be preferable to use separate columns. As the neutral axis of the column is at a distance from the edge on which the column rests, there is eccentricity, but this need not be considered if the section of the inner flange angles, the cover (whether plate, channel or I-beam) and 8 or 10 in. of the web plate be designed to take the entire direct load.

A letter the writer recently received dealt with two cranes lifting a combined load of 257 tons and states: "If one develops shear the two columns will not act together and the advantage of separate columns will be lost, with a probable increase of moment in the building column due to eccentric loads. . . . Obviously, also, there is a limit to the extent to which a slender building column can be said to cut down the $l/r$ of a crane column subject to heavy loads. . . . In designing a combined column, textbooks say nothing of variable moments of inertia. This fact has a considerable effect on the moments and I have computed them, taking variable moments into account, considering the base fixed and the top continuous, with an allowance for roof movement. . . . What minimum thickness of web plate can be used?" These are all pertinent remarks. The writer makes no dogmatic comments. In his own work, if in doubt as to the efficiency of the section of a crane column, he increases the sectional area until the doubt is removed. With the time the average structural engineer has at his command, this is often the best he can do.

In the foregoing the transverse force due to starting or stopping of the load on the crane bridge has not been considered. This will add somewhat to the bending stress in the column.

## Rapid Obsolescence Overtakes Six-Year-Old Building

THE OFFICE and showroom building shown in the accompanying photograph without doubt holds the record for rapid obsolescence. Occupying the greater part of the block front between 34th and 35th Sts. on 7th Ave., New York, it was built six years ago at the same time that R. H. Macy & Co. was building the nineteen-story addition to its department store which occupies the easterly section of the block. The two buildings at that time were separated only by a small building on a narrow lot running through the block, a building which the Macy company recently acquired and replaced by an extension of its new building.

MODERN OFFICE BUILDING BEING DEMOLISHED FOR EXTENSION TO DEPARTMENT STORE, NEW YORK CITY

When the Macy company acquired the office building on the 7th Ave. frontage, the question was raised as to whether it should attempt to convert the office building into one suitable for department store purposes or replace it with a new building. The chief obstacle to adapting the building to its purposes was the fact that the floor levels of the office building did not correspond to those of the new Macy building, the ceiling heights being considerably less. This made it difficult and expensive to adapt to department store use. Moreover, the cost of other needed changes was very high. It was therefore decided to tear down the entire upper portion of the office building and replace it with a building having floor levels corresponding to those of the adjoining new building.

When figured on a rental basis the new structure would cost per square foot per year only about 3c. more than the floor space in the then-existing sixteen-story structure and would be so much better in every respect as to easily warrant that difference. The steelwork in the columns of the lower floors was found to be of adequate section to carry the new building without change and consequently the tenants on the street floors and especially the tenant holding a long lease on the greater part of the basement and the ground floor for a restaurant, did not need to vacate.

The high sheds over the sidewalk are an unusual feature of the operation. They were put at the third story level in order to minimize their effect upon the business of the tenants occupying the main floor.

All construction operations are carried on from the 35th St. side of the building so that the interference with street traffic and shopping on 7th Ave. and 34th St. is at a minimum.

Robert D. Kohn and associates are architects, and Marc Eidlitz & Son are the contractors.

## Mount Vernon Memorial Highway

The Mount Vernon Memorial Highway, now under construction by the U. S. Bureau of Public Roads, may well serve as a model for similar parkway boulevards. The highway extends from a point on Columbia Island south of Arlington memorial bridge to Mount Vernon, a distance of 15 miles, and passes through historic Alexandria, Va. It has no grade crossings for the entire distance except through Alexandria. Underpasses and overpasses take care of all cross-traffic. At necessary access roads, the pavement is flared or widened to afford the maximum of safety for entering traffic. A grade-separation structure south of the Highway bridge, which crosses the Potomac near the north terminus of the highway, permits interchange of traffic over its four ramps from two levels and eliminates all left-hand turns. The highway has a maximum right-of-way 200 ft. wide and a pavement width of 40 ft., except through Alexandria and for a quarter of a mile between the Highway and the Richmond, Fredericksburg & Potomac Railroad bridges, just south of Washington, D. C. In Alexandria, it follows Washington St., the main thoroughfare, which is about 56 ft. wide. Between the bridges, the highway has a divided pavement, each strip 40 ft. wide, with a center parkway. The approach to Mount Vernon has been designed to permit the arrival and departure of cars and buses without confustion, and ample parking space for both private cars and buses has been provided. Construction of the highway was begun in September, 1929.

# New York Subway Construction—II

## *Street Staging and Decking for Open-Cut Subway*

### Ingenious Falsework Systems Developed to Maintain Street Services and Give Space Underneath for Power-Shovel Excavation, Motor-Truck Haulage and Erection of Subway Structure—Steel Largely Employed for Main Carrying Members

EXCAVATION, with its associated tasks of street decking, trench sheeting, drainage and pumping, underpinning structures and maintaining underground services, is the greater part of open-cut subway construction. Excavating methods and street support are closely related and directly dependent upon each other. Of all the construction operations they have changed most since the first New York subways were started. Mechanization of excavation and the design of street decking to accommodate excavating and hauling machinery under the street surface with as little interference as possible to both the street traffic overhead and the construction operations underneath are the outstanding accomplishments of the construction of New York's third subway system. A general article outlining the system and its construction characteristics appeared in our Aug. 7 issue, p. 200. —EDITOR.

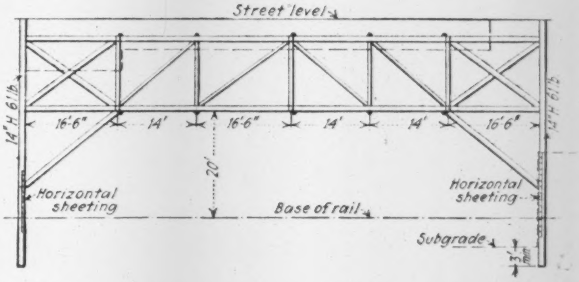

FIG. 2—DETAILS OF TIMBER-TRUSS TRENCH BRACING, HOUSTON ST., MANHATTAN

OPEN-CUT subway construction is predominantly a task of street trenching. This trench occupies a large part or the full width of the street between curbs and in narrow streets may extend to the building lines. Its depth is ordinarily no less than 30 ft. and may be twice as much in places, not considering excavation for special intersections and other structures. Virtually a whole street is repossessed where an open-cut subway is built; while construction proceeds all street traffic, all structures carried by the street, all buildings bordering it and all service conduits beneath its surface must be maintained. The first construction requirement, therefore, is a temporary structure in the trench which will serve all the functions of the original street and also will provide the bracing and working space requisite in opening the excavation and erecting subway structure within it. In brief, a street on falsework has to be provided for the construction of open-cut subway. This falsework is spoken of hereafter as street-decking structure.

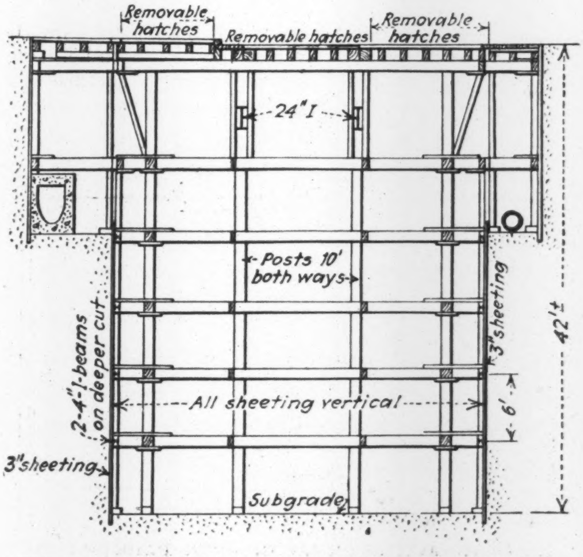

FIG. 1—OLD TYPE OF TIMBERING AND DECKING, PROSPECT AVE., BROOKLYN

Street decking was not used generally in constructing the first subway in New York (1900-1904) except at street intersections. The streets within the excavation lines were closed to roadway traffic and all excavating was done in the open, regardless of the inconvenience to adjoining property owners; only narrow sidewalks and runways were provided along the building fronts for pedestrian traffic and access. When the Brooklyn extension (contract 2) from Brooklyn bridge, Manhattan, to Atlantic Ave., Brooklyn, was begun in 1903, lower Broadway and some other streets were completely decked and this practice was followed in the construction of the second subway system in 1911.

The earliest decking structures consisted of heavy timber framing, the posts being set usually 10 ft. on centers both ways, and carried down in 6-ft. lifts as the excavation progressed. With the increased use of excavating machinery on the third subway system, commencing in 1925, many changes and improvements were made in decking design. More structural steel was used in the deck framing to provide longer clear spans under which the power shovels could work with less interference by posts and supports. In general, street-decking practice today is characterized by the extensive use of steel girders and piles; continuous girders are much used, to permit free shifting and replacement of parts.

#### *Broad Requirements and Conditions*

No specific design of decking is called for by the contract specifications, but the following requirements must be complied with:

> The street-supporting system and street decking shall be of sufficient strength safely to support, in addition to its own weight and that of pipes and other subsurface structures supported therefrom, the following loading: 200 lb. per square foot over the entire area of sidewalks and roadways, or on any 10x10-ft. area of sidewalk or roadway a loading of 10 tons on an axle, with wheels spaced 5 ft. on centers, located at the center of such 10x10-ft. area. Where the loading due to contractor's machinery or equipment is in excess of the above, the street-supporting system and the decking shall be of sufficient strength safely to support such machinery and equipment . The excavation of roadway pavements shall be made in sections followed immediately by the placing of decking. These sections shall be

handled in such an order that there will always be available, on one side or the other of a line 15 ft. away from the building line, a roadway on which the ladder trucks of the fire department can operate. All decking and street-supporting systems shall be so designed that during installation and removal at least one-half the width of the roadway and sidewalks can be kept open for traffic at all times.

### *Types of Decking Structure*

The design and arrangement of the street-supporting system depend on width and depth of cut; character of material to be excavated, which requires various degrees of side support; presence of street-car tracks; number and character of subsurface conduits, and the individual contractor's preference. With conditions so various and the ingenuity of the contractor virtually unhampered, street-decking structures submit to only a very loose classification by types. These are: longitudinal girders posted down to subgrade and carrying transverse deck framing; longitudinal girders on transverse girders posted down to subgrade; transverse girders spanning the trench and posted down to subgrade; timber framing; and combination types. In all but the straight timber type the girders are steel and frequently the supporting members are steel sections commonly driven down as piles.

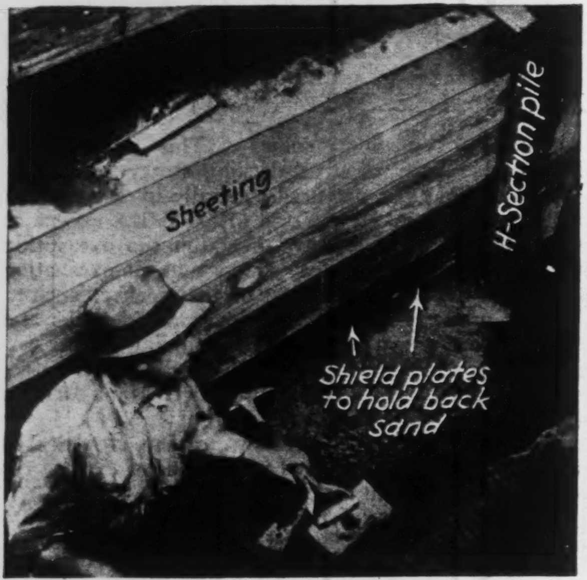

FIG. 3—PLACING HORIZONTAL SHEETING IN HOUSTON ST., MANHATTAN
Note use of steel plates behind lowest sheeting to keep sand from running into cut while next piece of sheeting is being placed.

There follow representative examples of the structure types. In considering these it is essential to keep in mind that in any operation it is only the general structure type that is held to; supplementary bracing and carrying members are required in many places and these vary in a multitude of ways. Evidence of this fact appears in the examples of street-decking structure selected for illustration, each of which shows the framing at a specific location while also indicating the general structure type.

*Timber-Staging Type*—Fig. 1 shows one example of the old-style timber staging as it was used on Prospect Ave., Brooklyn; it consists of posts 10 ft. on centers and of decking framed in panels 10 ft. square. This is a deep cut—maximum, 65 ft. Excavation is handled by cranes, with clamshell buckets operating on the surface and loading into trucks. The deck panels are removed one at a time and the excavation is carried down in 6-ft. lifts, a complete set of crossbracing being placed for every lift. The decking is unusually heavy to support the cranes and trucks as concentrated loads. This type of decking structure has been used in only a few places.

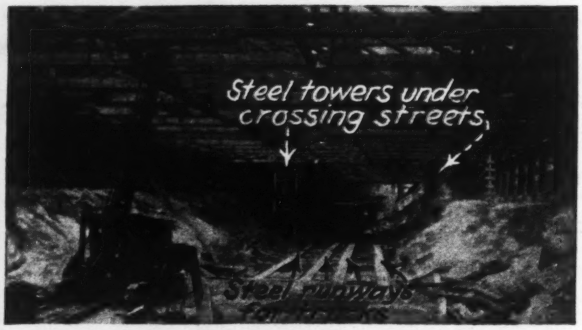

FIG. 4—CLEAR WIDTH IN HOUSTON ST. CUT UNDER TIMBER-TRUSS TRENCH BRACING

*Transverse Girder Types*—The notable transverse girder construction shown by Fig. 2 is being used in Houston St. in Manhattan, a four-track line. As this street is being widened in a city improvement program, the subway is being built mostly on what was private property adjacent to the street. The timbering system is therefore designed primarily for trench bracing, though decking was required to carry cross streets and Houston St. where the subway line crosses from the south side of the street to the north side.

In general, the bracing system consists of timber trusses 10 ft. deep, spaced 10 ft. on centers, which set on angles bolted to steel H-sections driven as piles along the sides of the trench. The H-sections are 50 ft. long, driven as piles on careful alignment and spacing to 5 ft. below subgrade. Horizontal sheeting of 5-in. timbers is placed between the piles and against the inside flanges as excavation progresses. When these sheeting timbers are being put in, vertical steel plates placed behind the lowest sheeting member and extending about 3 ft. below this member, keep the sand from running into the cut beneath the sheeting. These steel plates have horizontal angles welded on the inside faces which provide shoulders for driving as shown in Fig. 3.

Where street decking is required, it is placed on the trusses which are given additional support from below by steel posts, Fig. 4. This type of decking structure pro-

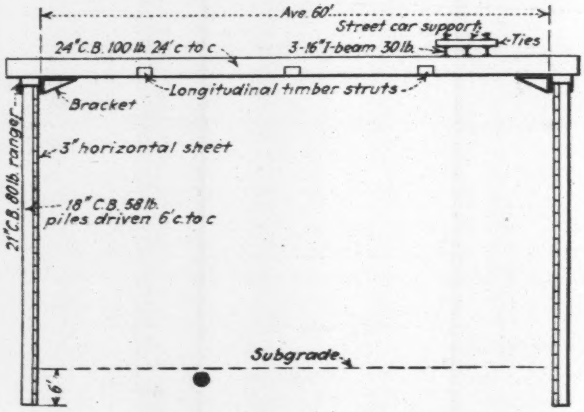

FIG. 5—TRENCH SHORING IN OPEN PARKWAY ON QUEENS BOULEVARD

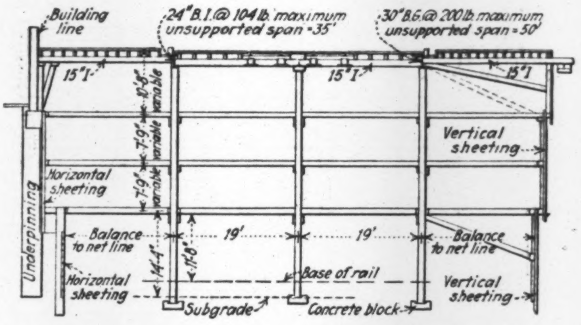
Building line
24" B.I. @ 104 lb. maximum unsupported span = 35'
30" B.G. @ 200 lb. maximum unsupported span = 50'
15" I
15" I
15" I
10'-8" variable
7'-9" variable
7'-9" variable
Vertical sheeting
Horizontal sheeting
Underpinning
Balance to net line
19'
19'
Balance to net line
14'-4"
11'-8"
Base of rail
Horizontal sheeting
Vertical sheeting
Subgrade
Concrete block

FIG. 6 — DECKING AND SHEETING, FULTON ST., BROOKLYN

vides a clear working space the full width of the trench for excavation and for permanent subway construction.

A somewhat similar system (Fig. 5) with 24-in. beams instead of timber trusses is being used on one of the Queens Boulevard sections in Forest Hills, Queens. This is a four-track line located in an open space between two roadways, requiring but little street decking except at cross streets and for a trolley line which sometimes swings onto the temporary trench bracing.

The general design is a row of 18-in., 58-lb. Carnegie-section steel beams driven on each side of the trench 6 ft. on centers to 6 ft. below subgrade, each row capped with a 21-in., 80-lb. beam, set with the web horizontal and bearing on the tops of the piles. Spanning the trench (averaging 60 ft. wide) at every fourth pile, or 24 ft. on centers, is a 24-in., 100-lb. beam resting on top of the rangers and bolted to them by brackets. The beams are braced apart by three horizontal rows of 6x12-in. timbers. Horizontal sheeting of 3-in. timber is placed between the pile beams and against the inside flanges. These are inserted in trenches dug by hand ahead of general excavation. A notable feature of this sheeting system is that it serves as a back form for the concrete subway walls.

*Longitudinal Girder Types*—A system of longitudinal girder decking used in heavily traveled Fulton St., Brooklyn, is shown by Fig. 6. Three continuous longitudinal beams (24-in., 105-lb. at the curb lines and 30-in., 200-lb. at the center of the street) form the backbone of this system. A system differing in detail used on the same street by another contractor is shown by Fig. 7.

Another construction, one of the first of its type to be used on the present subway work, is shown by Fig. 8. The work was in Eighth Ave. north of 122d St. in Manhattan. While the section illustrated is selected to show full-width decking and bracing of earth cut, the basic design of longitudinal steel girders carrying a timber deck is clear.

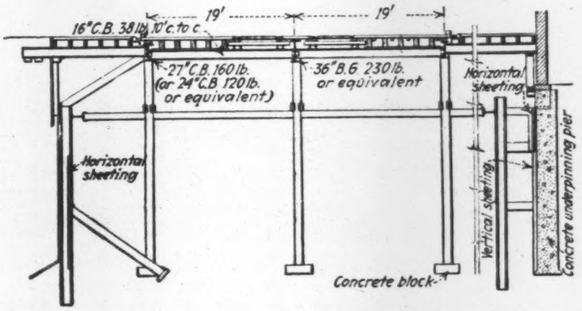
19'
19'
16" C.B. 38 lb. 10' c. to c.
27" C.B. 160 lb. (or 24" C.B. 120 lb. or equivalent)
36" B.G. 230 lb. or equivalent
Horizontal sheeting
Horizontal sheeting
Vertical sheeting
Concrete underpinning pier
Concrete block

FIG. 7 —ANOTHER TYPE OF DECKING AND SHEETING ON FULTON ST., BROOKLYN

Fig. 9 shows an essentially longitudinal girder decking having a partial transverse girder support which was used on the upper Eighth Ave. subway in Manhattan. The main supporting members are four longitudinal I-beams laid parallel to the track and to the curb. These beams were framed into pairs by means of 6x12-in. cross timbers resting on the lower flanges of the beams and by tie rods at intervals. Upon this framework the 6-in. deck was laid. The beams were laid as closely as possible to the street surface so as not to interfere with the subsurface structures. They were lightly spliced longitudinally so as to hold their alignment. The problem of supporting the two trolley tracks and allowing sufficient space for the operation of the electric shovels was solved by placing transverse beams in a heading preceding the shovel.

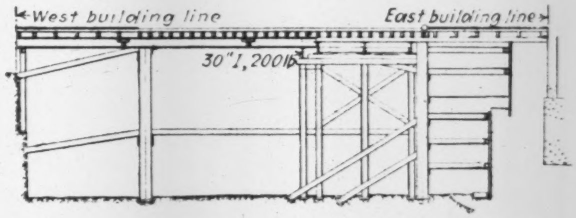
West building line
East building line
30" I, 200 lb.

FIG. 8—TIMBERING IN CUT, ONE SIDE EARTH AND ONE SIDE ROCK

These beams were placed at intervals of 10 ft. and were posted to subgrade first by timber posts which were fastened to the beams by means of angles so that the shovels could not readily displace them, and then by steel posts on concrete footings. The outer longitudinal beams were directly supported by posts at 10-ft. intervals and the inner longitudinal beams by blocking up from the transverse beams.

A notable construction used on Nassau St., a very narrow downtown street in Manhattan, is shown by Fig. 10.

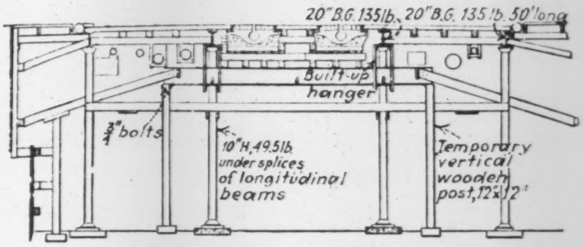
20" B.G. 135 lb.
20" B.G. 135 lb. 50' long
Built-up hanger
3/4" bolts
10" H, 49.5 lb. under splices of longitudinal beams
Temporary vertical wooden post, 12"x12"

FIG. 9—DECKING STRUCTURE OF LONGITUDINAL AND TRANSVERSE GIRDERS

Here the girders were posted down to concrete-filled steel cylinders jacked to below subgrade. An interesting detail of this decking is the suspension from the girders about every 10 to 20 ft. of transverse beam main braces for the trench walls.

*Longitudinal on Transverse Girder Type*—On the Eighth Ave. subway along Central Park, Manhattan, the structure shown by Fig. 11 was made notable by the use of open-web decking girders carried on similar transverse girders posted down to subgrade. The transverse girders were placed every 20 ft. by drifting under the street from trenches along the sides.

These special girders, 32 in. deep and weighing about 140 lb. per linear foot, were made of uniform-length web and flange and splice pieces, cut and punched to template, and assembled and bolted together on the job as required. The flange angles had lengths of 40 ft., 30 ft. and 20 ft., which, in different combinations, sufficed for all transverse and longitudinal girders. The open webs decreased the weight and provided clearance for conduits to pass through the girders if necessary. One of these girders, 40 ft. long, tested on the work, deflected 1⅛ in.

Near each end of each transverse girder, a 4x4-ft. pit was sheeted down to subgrade and in it there was set a vertical tower made of four 12x12-in. timbers, latticed on all four sides and having staggered joints. These towers were seated on timber grillages and their caps supported the transverse girders. Sections of pavement were removed at night and excavations made to permit the installation of five lines of continuous open-web longitudinal girders supported on posts bearing on the top flange of the transverse girders.

*Runner-Beam Types*—To permit the removal of supports for the free use of shovels a number of contractors have employed continuous (runner) beams. This permits excavation to be completed in fewer lifts, sometimes only one lift being required to reach subgrade (exclusive of excavation required to place the deck proper), a considerable advantage in speeding up the work.

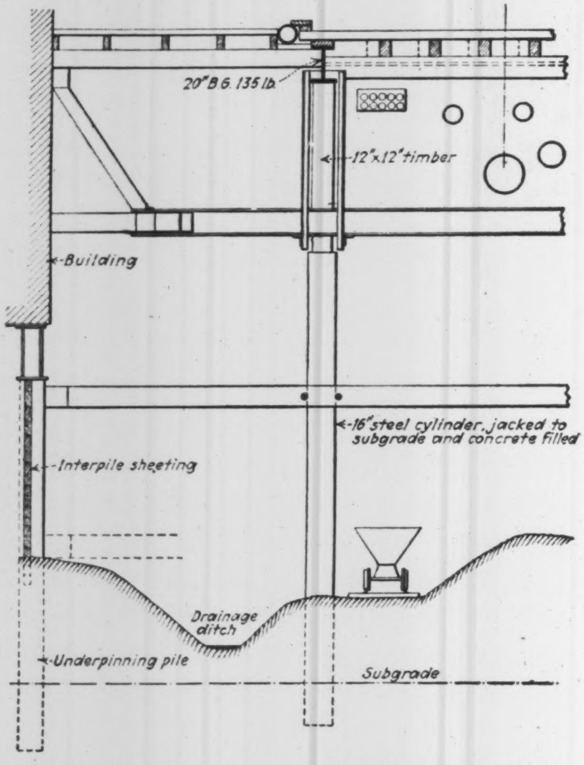

FIG. 10—LONGITUDINAL GIRDERS ON CYLINDER PILES, SUNK BELOW SUBGRADE

A typical example is the method used on Ninth St., Brooklyn, shown by Fig. 12. Here, continuous 36-in. beams, 80 ft. long, splice-welded at joints to develop full strength, were placed longitudinally on the deck, one end over solid ground, and the other extending back over the excavation, where it was posted up from subgrade. The steel cross-beams supporting the deck were hung from the runner-beams, and intermediate supports for as great a distance as 60 ft. were temporarily removed, giving a clear space the full width of the subway trench for the operation of the shovels and trucks.

On Schermerhorn St., Brooklyn, a new method of decking consisted of two continuous 30-in. beams (Fig. 13), welded at joints, underneath 24-in. transverse I-beams, which in turn carried longitudinal wooden stringers and the deck planking. The long runner beams permit the shifting of supporting posts to accommodate the shovels. On part of this work a deck system of 12x12-in. timbers was laid transversely across the runner beams.

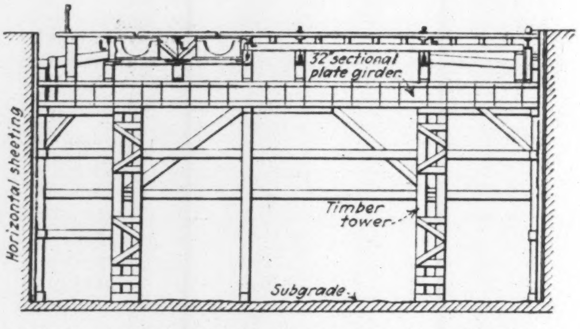

FIG. 11—LONGITUDINAL ON TRANSVERSE GIRDERS ON POST PIERS

*Posting Down Decking Structure*—Various methods have been employed to post the street-supporting structure to subgrade. The oldest is to insert posts just ahead of the excavation work, transferring the loads to longer intermediate posts as the excavation progresses. Another method is to sink sheeted pits to subgrade and erect posts or framed towers within the pits, the supports being so spaced that they need not be moved during excavation or permanent construction. This method was used in Church St., Manhattan, and is shown by Fig. 14. Some contractors drive steel beams, usually H-sections, as piling on carefully figured spacings (to clear the permanent steel placed later) to act as supports for the deck. Still another method is to sink a shallow pit just deep enough to clear the subsurface pipe lines, and then drive steel sections as piling to subgrade. The tendency is toward simpler framing so arranged as to require as little readjustment as possible during construction operations.

*Installing Decking Structure*—The first step in building the street supports and decking is to tear up the pavement in short sections of half the width of the street and excavate just deep enough below the subsurface pipes, sewers and conduits, to place the immediate supporting beams and the deck proper. The depth of excavation for this procedure varies from 3 to 10 ft. Where rock is encountered contractors are permitted to go to a depth of 12 ft. before placing decking, in order to provide working space for drillers under the decking. If rock is not encountered at a depth of 12 ft., contractors are usually permitted to uncover the rock before placing the decking, provided the rock is found at depths not greatly in excess of 12 ft. If subsurface conditions per-

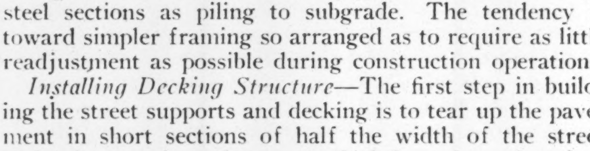

FIG. 12—RUNNER BEAM TEMPORARILY HOLDING TRANSVERSE DECKING BEAMS, BROOKLYN

Use of runner beams permits temporary removal of posts underneath to allow more room for operation of power shovels and cranes.

mit, the excavation is done by power shovels or cranes equipped with clamshells, loading into trucks alongside. This first operation causes more interference with street traffic than any other part of the entire subway construction except restoration, so it is handled as quickly as possible, often at night if street traffic is unusually heavy.

If the design of the decking structure calls for transverse beams the full width of the street, these are laid in trenches dug across the unexcavated half of the street or in drifts carried under the street paving from the excavated side. Sometimes these transverse beams are broken at the center line of the street and provided with bolted connections that make them continuous when the beams are placed in the other half of the street. After the decking is once laid and in place it is not disturbed except in local instances where planks are removed to place steel and concrete, as all work from this stage on is conducted from underneath.

### *Summary and Interpretation*

A survey of decking-structure practice as described emphasizes: (1) a radical change from the staging-type structure to the bridging type, with comparatively long spans and fewer supports; (2) the substitution of steel girders for carrying members and to a notable extent steel piles and steel sections driven as piles for supporting members; (3) the employment of long-span carrying girders to support temporarily sections of decking while the normal supporting members are removed to give free space for construction operations; (4) the use of horizontal timber sheeting fitted between H-section piles driven at intervals, generally 10 ft., in the side lines of the cut and braced apart across-cut at street level; (5) the use of girders made continuous over intermediate supports to prevent collapse of the decking in case a support is knocked out by accident; (6) posting the structure entirely down to subgrade ahead of all excavation except the preliminary cut for the carrying girders and decking; (7) the wide use of diagonal bracing, both transverse and longitudinal.

The common factor in these developments is the wide substitution of steel for timber. The greater strength and stiffness of steel shapes, the readiness with which short lengths for easy handling can be field-spliced to form continuous carrying members, the smaller bulk to be handled and to occupy working space, all contribute to make the more expensive material more economical. Indeed it can be confidently asserted that lacking steel for decking structure, power-shovel excavation and direct haulage could not have been generally employed and the placing of subway steel and concrete would have been greatly hampered.

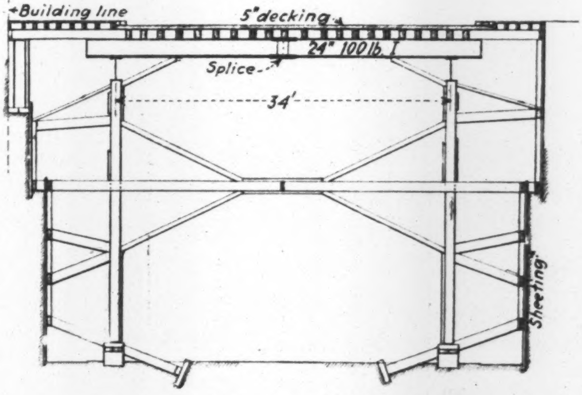

FIG. 13—DECKING STRUCTURE ON SCHERMERHORN ST., BROOKLYN

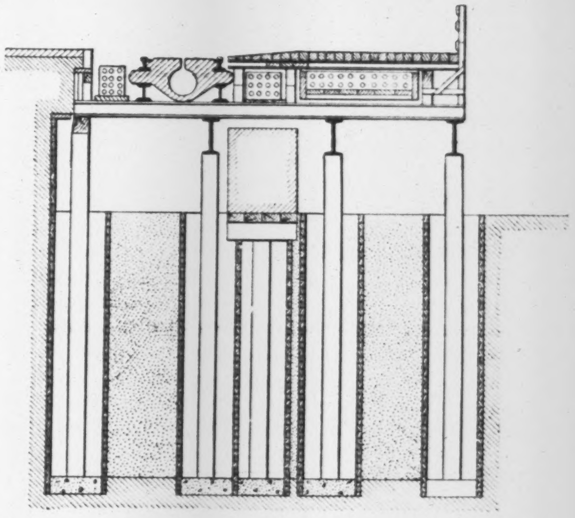

FIG. 14—SHEETED PITS SUNK TO SUBGRADE FOR CARRYING DECKING, CHURCH ST., MANHATTAN

### *Organization for Subway Construction*

The Board of Transportation of the city of New York has charge of the design and construction of the new subways. John H. Delaney is chairman of the board. Robert Ridgway is chief engineer and John R. Slattery is deputy chief engineer. The organization is divided into the following six divisions, with the division engineer of each named: design, A. I. Raisman; division I (construction of lines in Manhattan below 57th St. and in Brooklyn), J. O. Shipman; division II (construction of lines in Manhattan north of 57th St. and in Queens Borough and the Bronx), John H. Myers; tunnel division (all tunnel construction regardless of location), J. B. Snow; track, R. H. Jacobs; station finish, J. T. Kane; materials inspection, G. L. Lucas. Each section is in charge of a resident section engineer. Several sections are grouped under the direction of an assistant division engineer.

## Zambezi River Railway Bridge

A large railway bridge across the Zambezi River is to be an important development in the railway system of East Africa, since it will link two separate roads and thus form a continuous line of 350 miles northward from the east coast port of Beira. An authorized 125-mile extension will also bring the line to Lake Nyasa, on which there is navigation for 360 miles farther north. At present the Trans-Zambezi Railway extends 175 miles north from Beira to the river, while the Nyasaland Railway continues 175 miles from the opposite bank. A car-ferry steamer transfers traffic, about 2½ miles between landings, but the service is hampered by low water and sandbars. The former road will extend its line 28 miles up the river to the bridge site, but the other road will have to build only 6 miles. Deep foundation work in shifting sand is said to be required. The cost of the bridge and its 34 miles of connecting line is estimated at $12,000,000, and the necessary capital will be loaned to the railway companies by the Nyasaland government.

# Hydraulic Characteristics of Flow of Water Around Bends

## Helical Motion of Stream Observed in Flow Through Transparent Channel 10 In. Square

CO-OPERATIVE researches on the flow of water around bends have been carried out by the U. S. Bureau of Public Roads and the University of Iowa to determine the laws of pressure and velocity change in a flowing stream passing around a bend. Such flow exists wherever water flows in a crooked channel or meets a bridge pier or other obstruction. The investigations were carried on at the hydraulic laboratory of the University of Iowa under the direction of S. H. McCrory, chief, division of agricultural engineering, Bureau of Public Roads. Profs. S. M. Woodward and F. A. Nagler of the university acted as consulting engineers.

The testing apparatus consisted of a tank 5x5x8 ft. high, an approach channel 26 ft. long leading from the tank to the bend, a 180 deg. bend of 5 in. inner radius, and a discharge channel 30 ft. long. The bend as well as the two channels were constructed 10 in. square. The bend and 8 ft. of each (approach and discharge) tangent next to the bend were made of transparent material (pyralin or celluloid) so that studies might be made of the direction of flow of various particles of water in moving around the bend. Some 300 piezometric connections were made in the apparatus so as to study the changes in pressure as the water flows around the bend. Since a comparison of velocities at various points was essential to the investigation, special Pitot tubes, made and calibrated in the laboratory, were used in the tests.

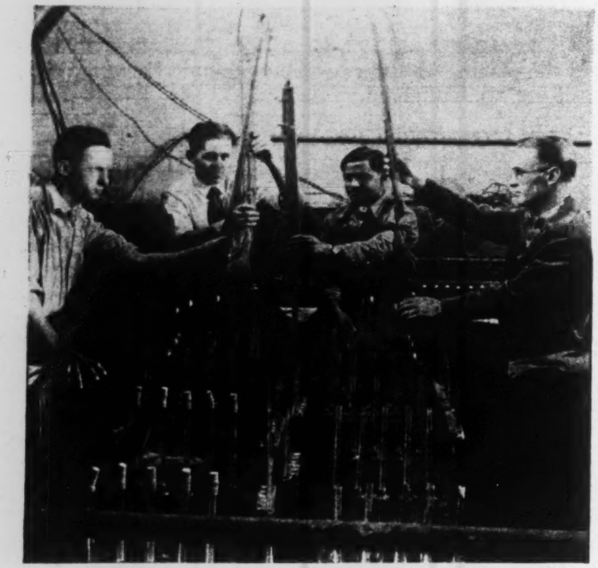

FIG. 1—DETERMINING VELOCITY DISTRIBUTION IN A PYRALIN 180 DEG. BEND

Pitot tubes gave readings of pressure at 300 points and velocities at 700 points.

Tests were made with the channel flowing full, under pressure, and also partly full. Experiments included studies with uniform velocity distribution, and also with non-uniform velocity distribution in the channel approaching the bend. This paper takes up only one phase of the investigation—namely, the direction of flow of the various particles of water in moving around a bend.

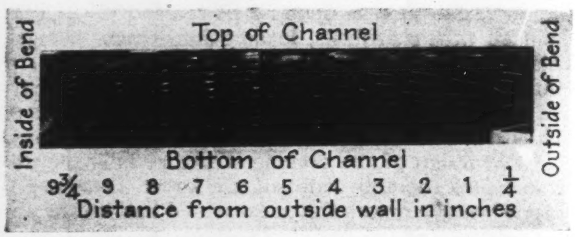

FIG. 2—ELEVEN PICTURES OF YARN ATTACHED TO PINS AT 1-IN. INTERVALS FROM OUTSIDE WALL

Channel 10 in. square; 180 deg. bend of 5-in. inner radius. Double spiral is indicated by yarns diverging near outside wall and converging near inside wall.

Let us consider the case when there is uniform velocity distribution in the channel approaching the bend. Then the water in the bottom part of the bend will rotate counterclockwise while the water in the top part of the bend will rotate clockwise, as shown in Fig. 3. If a pin to which are attached several yarns is placed in the channel next to the outside wall, the yarns should diverge; if placed next to the inside wall, they should converge. That such a condition prevails is illustrated in Fig. 2, which is composed of eleven separate pictures taken of yarns attached to pins and placed at various distances from the outside (right) wall of the channel.

Now take the case where the friction along the bottom of the channel is greater than that along the top. With this velocity distribution in the channel approaching the bend, the water will take a single spiral or helical motion in addition to its forward motion in flowing around the bend. This spiral motion would be counterclockwise, as shown in Fig. 4. Thus the yarns next to the outside (right) wall will deflect downward, Fig. 5, whereas those next to the inside wall will tip up.

Such spiral motion exists at the bends of rivers and is the cause of the erosion along the outer bank. The

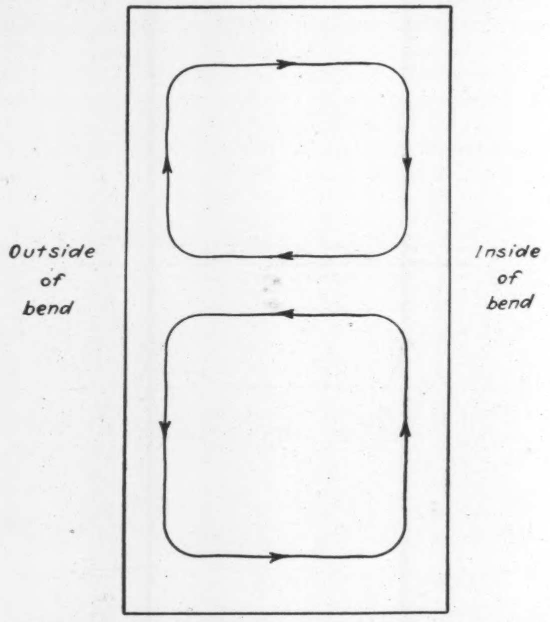

FIG. 3—NORMAL CONDITION OF FLOW IN CLOSED CHANNEL BEND GIVES DOUBLE SPIRAL

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Extracts from a paper by D. L. Yarnell, senior drainage engineer, U. S. Bureau of Public Roads, presented to the Iowa Engineering Society.

downward motion of the water rolls the particles of soil to the bottom of the channel, whence they are carried diagonally toward the inner bank. The water with highest velocity is not along the outer bank, as commonly supposed, but is along the inner bank. It is believed that the erosion at bridge pier noses is due to a similar action.

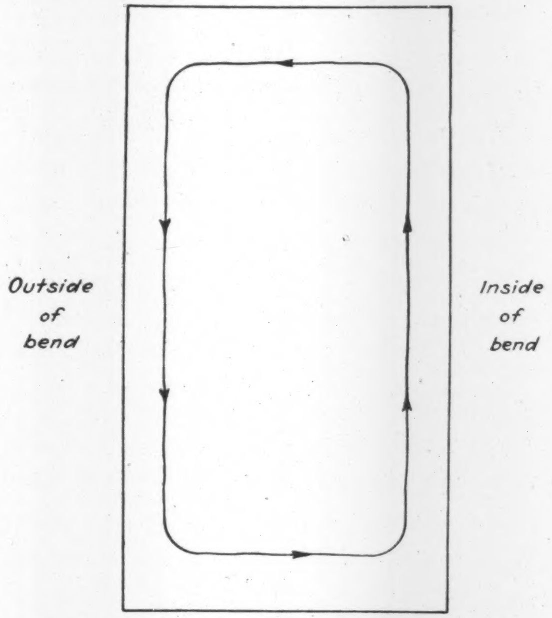


FIG. 4—NORMAL CONDITION OF FLOW IN RIVER BEND OR WHERE BOTTOM FRICTION IS GREATEST

The question may well be raised as to the practical importance of this spiral motion of water in bends. Since this motion represents head lost, attempt to straighten out the direction of flow of the filaments of water should result in increased efficiency. Quarter-turn draft tubes are now designed with guide vanes in the bend so as to make the water flow in a straight direction as well as to reduce eddy losses. We also find that the General Electric Co. has used in the 90,000-kw. turbine at the Crawford Ave. station of the Commonwealth Edison Co. in Chicago, sharp 90 deg. bends equipped with blade turns designed especially to reduce the spiral motion and consequent eddy losses. Sharp 90 deg. bends equipped with blade turns have also been applied to blower systems. E. D. Edwards, chief engineer of the East Peoria station of the Illinois Electric Power Co., has reported a saving equivalent of 347 tons of coal annually through the adoption of this type of bend in the duct system of his power plant. It is obvious that for water pipes this type of bend is practical only in the larger sizes.

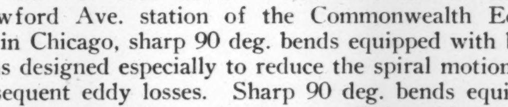
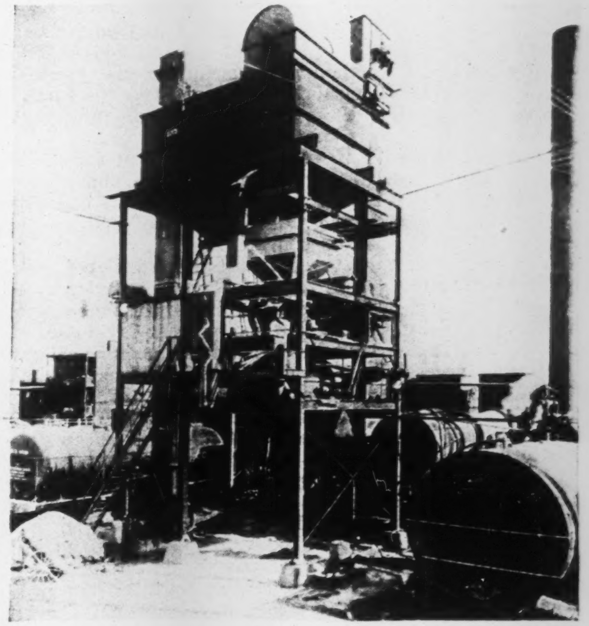


FIG. 5—FIVE PICTURES OF YARN AT BEND SHOW SINGLE SPIRAL COUNTERCLOCKWISE
Channel 5 in. wide x 10 in. deep, 5-in. inner radius. In a river bend, clockwise helical motion carries sand from outside of bend on bottom toward shoal water at inside of bend.

## Rotary Pressure Mixer Basic Unit in St. Louis Asphalt Plant

A NOVEL asphaltic concrete plant has been in operation for several months in St. Louis. It is owned by the Bridges Asphalt Paving Co. and, as shown in the accompanying illustration, is compact and completely equipped. Its basic unit is a pressure mixer consisting of a revolving drum containing no paddles or flights, into which the asphalt is sprayed by means of steam pressure. The drum has a capacity for a 5-ton batch.



A SELF-CONTAINED ASPHALTIC CONCRETE PLANT

Aggregates are handled and dried by usual methods and are stored in overhead bins, which are charged by means of inclosed bucket elevators. Rotary screens are interposed between the discharge end of the bucket elevators and the overhead bins. The three bins—sand, dust and large aggregate—discharge into a single weighing hopper directly over the drum. The asphalt charge also is weighed in a pressure tank, from which it is forced into the mixing drum.

The dry aggregates are introduced into the mixer and premixed dry for two minutes. Asphalt is then introduced through a manifold, which enters the mixer through a hollow trunnion, and is sprayed under about 50-lb. pressure while the aggregate is cascading in the drum. The complete mixture is rotated for about four minutes. Eight or nine 5-ton batches per day constitute the capacity of the plant. The mixing process is patented, and the contractor uses it on a rental basis. A crew of nine men is required to operate the plant. A city laboratory is maintained at the plant for supervision and control of the mixtures used on city paving work.

# Letters to the Editor

## *Why Lay Down Tight Plans for Highway Grading?*

Sir—Not long ago I noticed a comment by Thomas H. MacDonald, chief of the Bureau of Public Roads, in which he stated that the management studies by the bureau had disclosed the fact that not all of the highway designs were of economical construction from the contractor's point of view.

I believe this is particularly true of grade designs, for there are not many engineers in highway offices who have had experience from the contractor's side or who have studied dirt-moving costs sufficiently to understand the economics of balanced haul diagrams and the effect of a constantly varying length of haul on the cost of dirt moving. Many engineers will say that such study is not necessary, because the dirt contractors are bidding so low that haul refinement is unnecessary to get low cost roads. But if it is impossible for a contractor to move the dirt economically someone has to bear the cost if the job is done at all, and in a number of cases it is the community merchants who suffer because the contractor cannot pay his bills.

Laying grades and balancing dirt in a highway office has always been more or less of a tedious job and under the steadily advancing method of constructing the grade and compacting it before putting on a rigid type of surface I question the necessity of the present refinement in earthwork grades. It is common knowledge that the grades for the original flat subgrade are seldom a perfect fit for the concrete pavement after the proper amount of compacting has been done. In most cases it is necessary to run a new profile and compute a new set of grades in order to avoid excessive cut and fill by the paving contractor.

Why is it necessary to go to all the trouble of staking and computing the grades twice? Highway engineers have learned that it is not necessary to lay long tangent grades similar to railroad grades for our present-day motor cars and trucks. It has been proved that an economical grade line is not necessarily a straight one both from a hauling standpoint and from the construction standpoint. Why not, then, eliminate some of this preliminary construction engineering and use the method that has been successful on county roads for years and build the preliminary grade by eye and let the contractor get the dirt where he can, with the least expenditure of money and energy? It can be done and the dirt can be handled with much greater advantage under field observation than under plans worked up in the office, sometimes miles from the job.

Some years ago I served as resident engineer on a project in one of the state parks in northern Wisconsin. The funds of the park commission were limited and time was short in which to complete the work. The route and the right-of-way had been laid out and cleared by the park rangers, so it was decided to build a graded and drained road without making preliminary plans. The division engineer of the highway commission made an approximate estimate of the required yardage, and this formed the basis for the contract letting with a liberal overrun and underrun provision and no overhaul allowed except on clay surfacing material for sandy sections.

The contract called for a level subgrade section of the width and type used by the Wisconsin highway commission. All hills were to be cut and valleys filled to secure an easy riding grade in the opinion of the engineer. The contractor was to secure the necessary excavation within the limits of the right-of-way. Preliminary cross-sections were taken of the natural ground, and after the grading was completed final cross-sections were taken to compute the actual excavation done. I have no record now of the actual quantities in comparison with the original estimate, but I remember that the difference was not excessive with a bid price of 40c. a cubic yard.

I believe the resulting grade is satisfactory for present-day high-speed traffic, and I know that with very little work the road could be profiled and a satisfactory paving grade laid without having to do all the preliminary work ordinarily done under the present method.

Except for the fact that it would require resident engineers with a fair amount of imagination to direct the work in the field I do not see what objection there can be to this method of allowing the contractor to get the dirt where he can do it most conveniently and specifying an easy riding grade, provided that the necessary grade-control points are specified also and the proper drainage worked out in the field.

I am offering this idea for discussion in the hope that out of it may come a simpler method than the one in present use on highway grading work. D. V. Purington,

Goliad, Tex., Assistant Resident Bridge Engineer,
Aug. 18, 1900. Goliad County, Tex.

## *Cast-Iron Pipe Failures*

Sir—I was much interested to note the comments of Professor Lambie in his letter of June 20 relative to the cast-iron pipe failures reported in *Engineering News-Record*, June 5, 1930, p. 931. However, I believe that he is mistaken in his contention that these pipes would have safely carried the load imposed upon them if they had been placed in concrete cradles.

There is no question that cradling pipe conduits increases their supporting strength very materially, but if, in the case of a projecting conduit such as a culvert, the concrete cradle acts to reduce the normal settlement of the conduit, the load on the pipes will be increased and the advantage of a greater supporting strength may be partly or wholly dissipated. The very great effect which the settlement of the top of a conduit has upon the load due to the filling material over it has been demonstrated many times in researches, both here at Iowa State College and at the University of North Carolina.

In this particular instance, if the pipes had been placed in a concrete cradle, all possibility of settlement of the culverts would have been eliminated, because the cradle would of necessity have rested directly on the solid rock subgrade. The tops of the pipes could have moved downward only the amount of the vertical deflection of the pipe. In the case of group C of culvert No. 2 for example, this condition would have produced a probable settlement-deflection ratio ranging from 1.4 to 2.8. These ratios give loads of 25,000 to 31,000 lb. per linear foot, whereas the pipes are carrying only approximately 12,000 to 14,000 as actually installed. Schlick (Bulletin 93, Iowa Engineering Experiment Station) concludes that the supporting strength of concrete culvert pipes is increased from 1.5 to 2.0 times by cradling, and these results may reasonably be applied to cast-iron pipes. Thus we see that if these culverts had been concrete cradled, the strength would have been increased 1.5 to 2.0 times, whereas the load on them would have been increased 2.0 to 2.5 times and the net result would have been distinctly detrimental to the culverts.

It seems to me, therefore, that the Iowa highway commission adopted the only feasible means of rendering these culverts capable of carrying the load, when they specified that the pipes be laid on an earth cushion instead of on a concrete cradle. Although two of the culverts failed, they failed not because of the earth cushion underneath them, but because this cushion was not completely effective in allowing the culverts to settle enough to relieve them of damaging loads. In one case this lack of effectiveness was due to insufficient depth of the cushion over a short length of the culvert, and in the other to the fact that it was in a frozen state while the embankment was being built. That the principle is sound is amply demonstrated by the fact that in culvert No. 2 the pipes under the highest portion of the fill are good, whereas some sections under considerably less fill failed, simply because they did not have sufficient depth of cushion beneath them and they encountered a solid foundation in the course of their settlement.

The failure of any engineering structure is, of course, a regrettable affair. But when failures do occur, it is even more regrettable if we jump at erroneous conclusions as to the cause of failure and thereby submerge the basic principles involved. M. G. Spangler,

Ames, Iowa, Associate Structural Engineer,
Aug. 20, 1930. Iowa Engineering Experiment Station.

# News of the Week

### Municipal Power Bond Issues Defeated in San Francisco

By a decisive vote of about three to one the voters of San Francisco at the primary election held Aug. 26 defeated the proposed bond issues, the proceeds of which were to be used for the further development of the municipal power project. The four proposals, all of which were defeated, included: $44,600,000 for the purchase of the local distribution system of the Pacific Gas & Electric Co., $18,945,000 for the purchase of the Great Western Power Co.'s system, $3,525,000 for necessary changes in stepdown stations, interconnecting lines, substations and similar expenditures and $1,045,000 for the Red Mountain Bar power plant—a total of $68,115,000.

Throughout all the precincts of the city the percentage of negative votes was fairly consistent. The bond issues were opposed by the united business interests of San Francisco, the largest groups of improvement clubs and many independent organizations. The principal proponents of the measures were the board of supervisors and labor organizations.

Details of the proposed bond issues were published in *Engineering News-Record,* issue of June 5, p. 945.

### Hudson River Bridge Approach Bids Asked For

Proposals for the construction of the Riverside Drive connections of the Manhattan approach to the Hudson River bridge will be received on Sept. 15. These connections extend from West 178th St. and Haven Ave. to a point approximately 200 ft. south of West 168th St. at Riverside Drive. They will comprise roadways making connections with Riverside Drive at three points and effecting separation of onbound and offbound bridge traffic. The work involves excavation, filling, concrete, granite and rubble masonry construction, paving for the roadways and the reconstruction of sewers, water mains and other utilities. Completion will be required by Oct. 1, 1931.

### Framework of Gymnasium Collapses at West Chester, Pa.

Steel framework of the new $300,000 gymnasium being erected at the State Teachers' College at West Chester, Pa., crashed to the ground on the afternoon of Aug. 25. One steel worker was injured and six others had narrow escapes. The steelwork, which was nearly completed, suddenly began to sway and then fell to the lawn in front of the building site. The structure covered an area of about 600x200 ft.

## Moffat Tunnel Bond Dispute May Go to U. S. Supreme Court

IT IS possible that the legality of the $8,750,000 Moffat tunnel supplemental bonds will have to be decided by the U. S. supreme court. On Aug. 22 Eastern holders of the disputed bonds petitioned the federal court in Denver for a writ of mandamus to force the Moffat Tunnel Commission to pay the overdue interest on the bonds, amounting to approximately $500,000. The plaintiffs also asked that a receiver be appointed to handle all Moffat tunnel taxes collected up to date.

As the tunnel commission is already under orders of the Colorado supreme court to pay no interest on the supplemental bonds until a pending suit attacking their legality is decided, a favorable decision in the federal court for the bondholders would place the tunnel commission in the position of being ordered to do something by the federal court while still under orders not to do it by the state high tribunal. In that case, it is believed, only the U. S. supreme court could untangle the legal knot.

In their suit the bondholders assert that they bought the bonds in good faith and that taxpayers in the Moffat tunnel district and all other individuals and groups have no legal right to block the payment of the interest or to attack the validity of the securities.

They ask that their holdings be declared valid, that the assessments of more than $30,000,000 against the property be declared valid, that a receiver be appointed to take charge of all tax moneys and keep them for the bondholders, that the tunnel commission be required to give an accounting of all money in the bond fund and that the commission be forced to levy and collect tax assessments and to pay interest that is due and which will become due on the bonds in question.

### Pennsylvania R.R. Suburban Terminal to Open Sept. 28

The new underground station of the Pennsylvania R.R., which will accommodate Philadelphia's suburban traffic, will be opened Sept. 28. The station, located at Fifteenth St. and the Parkway, is 1,000 ft. long and 200 ft. wide, extending under the surface approximately 15 to 18 ft. There are nine entrances and exits and also underground connections with the Broad St. subway concourse and with the subway. Particular attention has been paid to ventilation, and facilities for the comfort and requirements of passengers, such as ticket offices, restaurant, barber shop, first aid station, rest rooms and telephone exchange have been provided.

In designing the station, provision was made to provide facilities to take care of what is believed to be the normal increase in traffic during the next 35 years. Details of the plan of the structure when it was proposed were printed in *Engineering News-Record,* May 28, 1925, p. 898. Robert Farnham is chief engineer in charge of the Pennsylvania R.R. terminal improvements. Beginning Sept. 28, the present Broad St. station will be used only for steam trains.

The Pennsylvania's new bridge over the Schuylkill has been finished. When the suburban trains begin using it, demolition of the three old bridges which now carry the trains will begin.

*Southern Pacific Photo Service*

SUISUN BAY BRIDGE, SAN FRANCISCO

**Construction of the Suisun Bay bridge across an arm of San Francisco Bay by the Southern Pacific Co. is nearing completion. Official dedication will take place some time during November, according to present plans. This photograph was taken on June 23, 1930.**

## Fraud Alleged in Award of Canadian Township Contracts

The council of York township, Canada, has unanimously decided to open a judicial inquiry into all municipal contracts, amounting to about $7,000,000, awarded in the municipality during the last five years. This action was taken as a result of a report by Gore, Nasmith & Storrie, consulting engineers, who said: "In all our experience we have never come across such an almost unbelievable state of affairs, involving conditions anything like those disclosed as the result of our investigations."

Some of the most pointed criticisms in the report were those of "carelessness and incompetence" shown in checking up contracts awarded by the council, and a charge that tenders, after having been opened by the council in session, bore evidence of having been tampered with.

## Detroit City Planning Commissioner Resigns

John F. Hamilton has resigned as a member of the Detroit city plan commission and in his resignation gives as the reason the fact that the city council constantly ignores the recommendations of the commission. Mr. Hamilton declares that men of standing and ability compose the commission, that they have never made a recommendation in regard to any street or other civic improvement without due thought, and that the intention of the city charter is that the body's recommendations should be followed in the absence of evidence justifying some other course. Nevertheless, he alleges, the council on numerous occasions has acted directly against the findings of the city planners and in other cases has not even taken the commission's communications from the table. Mr. Hamilton was appointed to the commission on March 25 of this year, succeeding J. Bell Moran, who resigned a few days before the inauguration of Mayor Charles Bowles. Mayor Bowles was recently recalled by the votes of the citizens.

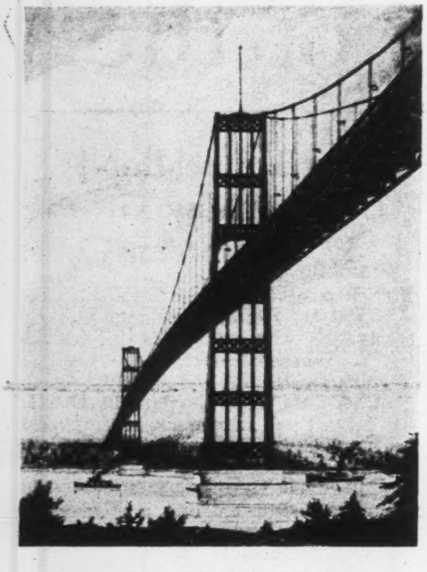
## New Terminal Plan for Montreal Submitted to the City

Radical changes in the character and arrangement of tracks and terminal facilities in the projected new terminals for the Canadian National Railways in Montreal are proposed in a report submitted to the city by William C. Lancaster, chief engineer of the Transit Commission, New York.

Since June, 1929, when the Canadian parliament gave its approval of the project under consideration, the Canadian National Railways has been engaged in the preliminary work of reconstructing its entire terminal on the island of Montreal. Its plans call for grade separation for most tracks within congested sections of the city, generally by elevation, abandonment of the old Bonaventure station as a passenger terminal and the construction of a new passenger terminal near the end of the Mount Royal tunnel. Early this year dissatisfaction with that project was expressed and the city asked the railway company to delay the work while it had the entire project reconsidered. Mr. Lancaster was employed to make the report. Charles E. Fraser, president of the Fraser Brace Engineering Co., collaborated with Mr. Lancaster in the preparation of the report.

Mr. Lancaster's report favors depressing the railway tracks through the central parts of the city, reconstruction of Bonaventure as an underground terminal for passenger use, and abandonment of the large terminal at the tunnel portal. Mr. Lancaster estimates that the gain in real estate values through depressing the tracks and the return from rental of air rights over depressed tracks will go a long way toward offsetting the increased cost of the plan which he proposes.

No change in the project as now laid down can be made without act of parliament.



**WALDO-HANCOCK BRIDGE**

**The contract for erecting the superstructure of the new state highway suspension bridge over the Penobscot River at Bucksport, Me., has been awarded to the American Bridge Co. for $510,000. This contract comprises all steelwork, including cables, and in addition the roadways on the approach and main spans. Two other bidders, the Phœnix Bridge Co. and the Bethlehem Steel Co., submitted bids of $535,066 and $647,319 respectively. The estimate of the engineers, Robinson & Steinman, New York City, was $530,117. The structure, to be known as the Waldo-Hancock bridge, will have a suspended span of 700 ft. and a channel clearance of 135 ft. The illustration is from architect's drawing.**

## Final Plans Approved for Toll Bridge Across Golden Gate

Final plans were approved Aug. 28 by the board of directors of the Golden Gate Bridge and Highway District for the construction of a toll bridge across the Golden Gate, the entrance to San Francisco's harbor, and arrangements have been made to place on the ballot for the general election to be held Nov. 4 a proposed $35,000,000 bond issue to defray the cost of construction. The main span of the bridge will be 4,200 ft. long, with a vertical clearance of 220 ft. The supporting piers and towers will be about 740 ft. high above the water.

### Other Bond Issues to Be Voted On

Propositions for other bond issues amounting to $5,850,000 will be on the November ballot. They represent three separate issues which the board of supervisors has approved by enacting preliminary legislation. They are: airport development, $4,000,000; garbage incinerator, $1,000,000; new county jail, $850,000.

If voted, the revenue from the issue of airport bonds will be used to make complete payment on the site of Mills Field, which the city has under contract for a total of $1,050,000. The balance of the airport money will go to build additional hangars, new landing fields, dredging a channel for seaplanes and filling in an area of approximately 750 acres of partly submerged land.

## Consultants Nominated to Check Los Angeles Water Program

A consulting board of three engineers has been nominated by the Los Angeles Chamber of Commerce to go over the engineering and geological features of the $38,800,000 water-development program of the city. The nominations were made to the board of water and power commissioners, which withheld action on them until a future meeting. Those selected are: Charles P. Berkey, professor of geology, Columbia University, and Louis C. Hill and J. B. Lippincott, of Los Angeles.

Professor Berkey is consultant on geology for the New York City board of water supply and has also acted in a consulting capacity on many other water projects throughout the country. Mr. Hill has been consulting engineer on many projects on the Pacific Coast, including the Roosevelt dam, Elephant Butte dam, Laguna dam, Gibraltar high arch dam at Fresno and the Boulder Canyon dam. Mr. Lippincott was at one time assistant chief engineer of the Los Angeles aqueduct and acted as consultant for the cities of San Diego and Denver in relation to their water problems. He was one of the engineers selected by Los Angeles city council to investigate the St. Francis dam disaster.

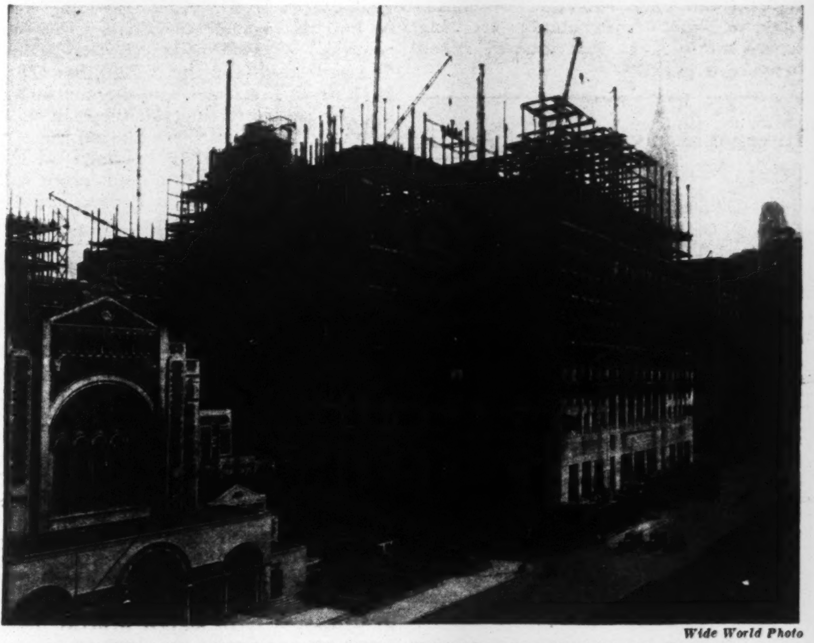
## Paving Brick to Be Laid on Iron Base in Illinois

Three different designs of brick paving with a sheet-iron base will receive their first test in 150 ft. of pavement on the Grand Ave. connection with the Rochester Road near Springfield, Ill., a contract for which has just been awarded. The road will have a carefully rolled and leveled subgrade on which the iron base will be laid. Next will follow a mastic sand cushion upon which will be placed a layer of 2½- or 3-in. brick with asphaltic filler. Three 50-ft. sections will be laid with the iron base, one using blue annealed flat sheets the two others galvanized corrugated sheets, in one case with corrugations parallel to the road and in the other transversely. The flat iron base will be ¼ in. thick, while the corrugated iron will be 10 gage. Expansion and contraction in the flat iron section will be provided for by overlapping sheets along the center line. One transverse edge will be turned down to grip the roadway, while the other edge, lying transverse to the road, will be supported upon the adjoining plate section to provide free movement. The ends of the plates at the edge of the pavement will be turned up to form retaining walls for the paving material.

In the section where corrugated galvanized sheets run parallel to the highway, the outer edges will be turned up as in the flat iron section, while one edge of each other sheet will be turned down to grip the roadway. Sheets will be lapped one corrugation, with a T-bar used under each transverse joint. Where the corrugations run transversely, a 16-ft. 8-in. L-section will be welded along the outer edge to retain the brick, while the sheet ends along the center line will be laid on a T-bar. One transverse edge of each sheet will be turned down to grip the roadway, while the other edge will lap on the adjoining section.

## Organizing Commission Named for International Road Congress

Nine representatives of organizations connected with the International Road Congress have been appointed by President Hoover to the American organizing commission to prepare preliminary arrangements for the sixth annual session to be held in Washington, Oct. 6 to 11. The commission consists of: Roy D. Chapin, former president of the National Automobile Chamber of Commerce; Thomas H. MacDonald, chief, Bureau of Public Roads; Wilbur J. Carr, assistant secretary of state; Thomas R. Taylor, assistant director, Bureau of Foreign and Domestic Commerce; A. J. Brosseau, vice-president, Chamber of Commerce of the United States; H. G. Shirley, commissioner of highways of the State of Virginia; H. H. Rice, Highway Education Board; Robert Hooper, American Automobile Association; Charles M. Upham, American Road Builders Association.



*Wide World Photo*

**NEW WALDORF-ASTORIA HOTEL, NEW YORK CITY**

**This new hotel is now under construction at Park Ave., 49th and 50th Sts., New York City. This view, looking south on Park Ave., was taken the last week in August and shows the building erected to about one-third of its contemplated height. In the left foreground may be seen St. Bartholomew's Church and in the right background is the Chrysler Building. The hotel is expected to be opened by Oct. 1, 1931. Schultze & Weaver are the architects, Clyde R. Place is the consulting engineer, and the Thompson-Starrett Co. is the general contractor.**

## Texas & Pacific Proposes 333 Miles New Lines in Texas

The Texas & Pacific Railroad announced on Aug. 25 a proposal to build 333 miles of new lines extending northward from its main line at Big Spring, Tex., into the South Plains and Panhandle sections of the state. Formal application for permission to build the lines has been made to the Interstate Commerce Commission, and a charter was granted at Austin, Tex., on Aug. 25 to the Texas & Pacific Northern Railway Co., a subsidiary of the Texas & Pacific, to construct and operate the new road. From Big Spring the proposed line swings northwest and north through Lamesa, Brownfield, Levelland, Littlefield, Dimmitt and Hereford and terminates at Vega. One branch will lead to Lubbock and another, taking off at Dimmitt, will reach Canyon and Amarillo. The cost of the extensions is estimated at $13,000,000.

Opposition to the proposed line has been expressed by the Santa Fe (Panhandle & Santa Fe), the Rock Island and the Forth Worth & Denver City (Colorado & Southern). The line from Big Spring to Vega crosses five lines of the Santa Fe and the Lubbock and Amarillo branches will connect with the Santa Fe at three more points. Connections with the Rock Island are made at Vega and Amarillo and with the Fort Worth & Denver City at Lubbock and Amarillo.

J. L. Lancaster, president of the Texas & Pacific, announces that construction will begin immediately upon approval of the I.C.C. E. F. Mitchell is chief engineer of the T. & P.

## New Record Aimed At in Willow Mattress Construction

A new record in willow mattress construction seems probable on the bank protection work being done in Memphis harbor by U. S. engineers, it is stated by Area Engineer F. I. Louckes, who is in charge of the operation.

"Under the original plans," said Mr. Louckes, "the mattress was to be constructed in three sections of approximately 1,000 ft. each. However, it has now been decided to build it in one section of 3,000 ft. Barring unforeseen circumstances, we shall establish a new record."

The present record mat had a length of 2,825 ft. and was constructed in September, 1929, by Construction Supervisor Gillham Rolfe at Trotters Landing, Miss.

## Shortest Railroad in Canada Is Junked

The shortest railroad in Canada was junked on Sept. 1. The Fort Erie, Snake Hill & Pacific, operating between Fort Erie and Fort Erie Beach, made its last run over its 2-mile stretch on Labor Day.

## Soviet Engineers Here to Study Road-Building Methods

Eight Soviet engineers will spend the next two months in Minnesota studying road-building methods, including bridge building, pavement construction, bituminous work, gravel and other low-cost construction. After an intensive study of plans and surveys in the drafting rooms of the central offices of the highway department, they will spend several weeks in active work in the field.

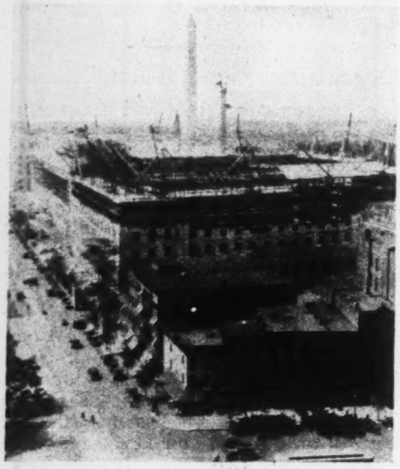
In announcing the arrival of the Russian engineers, Charles M. Babcock, Minnesota commissioner of highways, said: "The group of engineers from the Soviet government selected Minnesota because this state has a greater variety of road problems than most states and many of the conditions here similar to those in Russia: densely populated metropolitan areas, highly developed agricultural regions, widespread level prairies, timber areas, swampy regions and regions with high bluffs. Winter road making will also be studied, as conditions here are very similar to those in Russia, and Minnesota was the first state to adopt a snow-removal program for the entire state highway system."

## California to Aid District in Building Bridge

The California state highway commission has agreed to co-operate with the Russian River Crossing Joint Highway District in the construction of a steel and concrete bridge and approach across Russian River at Jenner-by-the-Sea, in Sonoma County. The bridge district is composed of San Francisco, Marin, Sonoma and Mendocino counties, and the contributions to the cost of the span will be as follows: State of California, $65,000; Sonoma County, $85,000; San Francisco County, $15,000; and Marin and Mendocino counties, $12,500. The bridge will facilitate travel from the northern counties south along the coast.

## Soldiers and Sailors Memorial Bridge Dedicated in Harrisburg

On Aug. 22 the Soldiers and Sailors Memorial Bridge, built as a memorial to the citizens of Pennsylvania who fought during the World War in the military and naval forces of the United States, was dedicated at Harrisburg, Pa. The structure, of concrete arch design, connects the Capitol grounds with the section of Harrisburg known as Allison Hill, spanning the Pennsylvania Railroad tracks and the deep ravine drained by Paxton Creek, and ends at the intersection of State and Thirteenth Sts. Construction of the bridge was begun in September, 1926. For the construction of the bridge the State of Pennsylvania contributed $3,610,000, and the city of Harrisburg added $300,000, collected by popular subscription. The contractor for the bridge was the James McGraw Co., Ross and Dehron were the architects, and August G. Brussart was resident engineer. The construction took place under the supervision of Samuel D. Rambo, deputy secretary of the department of property and supplies, and Frank St. Clair, Jr., chief engineer of construction. Mr. Rambo died the day before the dedication of the bridge took place.



**NEW DEPARTMENT OF COMMERCE BUILDING, WASHINGTON, D. C.**

**Good progress is being made on the Department of Commerce Building in Washington. This view shows the building with the Washington Monument in the background. The buildings in the foreground, fronting Pennsylvania Ave., will soon be razed to make a park.**

## International Congress of Architects May Meet Here in 1931

The International Congress of Architects will be asked to hold its 1931 meeting in the United States, it is announced by the American Institute of Architects. The opening sessions are planned to be held in Washington in connection with the convention of the institute. Later it is planned to have the congress convene in New York and after that in Chicago as a part of the architectural program of the World Exposition. Practically all of the leading nations of the world have accepted the invitation of the Hungarian government to participate in the 1930 congress, which will be held in Budapest Sept. 7 to 14.

## Large Coal-Washing Plant to Be Built at Clairton, Pa.

The Carnegie Steel Co., one of the operating subsidiaries of the United States Steel Corporation, has contracted with the Koppers Rheolaveur Co. for the design and installation of a large coal-washing plant at the Clairton By-Products Coke Works. The plant will have a washing capacity of 12,000 tons per day of twenty hours, and will cost approximately $2,000,000.

## Injunction Asked Against Bath St. Viaduct, Baltimore

Application for an injunction to restrain the municipality of Baltimore from proceeding with the construction of the Bath St. viaduct has been filed in Baltimore. Four taxpayers have filed the suit against the mayor and city council and ask the court to restrain the officials from proceeding with the project, which is authorized by a city ordinance. The action is based on a declaration that advertisements for the project were inadequate in that they failed to give complete dimensions of the street alterations involved, and therefore no clear idea of the proposed project has been given to the public. There has been considerable opposition to a plan advanced as a part of the project and which would take in a part of Preston Gardens, on St. Paul St., and this is cited in the bill of complaint. Chief Judge Samuel K. Dennis has signed an order requiring the city to show cause why the injunction should not be granted.

## Pensacola, Fla., to Have New Bridge Across Perdido Bay

Bids have been requested from contractors for construction of a bridge 3,800 ft. in length across Perdido Bay, near Pensacola, Fla. Work is expected to begin early in September. The Lillian bridge, as it will be known, will connect Escambia County, Florida, to Baldwin County, Alabama, and will be built by agreement between the two counties. The Florida county has authorized bonds for the bridge, but these have never been sold, and the contractor will be requested to take them in payment and negotiate them himself.

Work has also been resumed on the 4½-mile bridge which on completion will span the entire width of Pensacola Bay. The bridge is about three-quarters completed.

Another bridge about 2,000 ft. long will soon be built across Santa Rosa Sound, from the mainland to Santa Rosa Island, which has already been provided for in the budget of the Northwest Florida Bridge Corporation for 1930. Work will be started the latter part of this year.

## New Water-Supply Plans for Clarksville, Ark.

Plans for securing a new water supply for Clarksville, Ark., from Big Piney Creek are now under consideration. A large percentage of the property owners have signed a petition for the consolidation of the light and water districts for the purpose of improving the water plant. The project, plans for which were prepared by W. L. Winters, engineer, of Fort Smith, Ark., is estimated to cost $186,450, and calls for an intake tower 9 miles from the town on what is known as Beaver dam on Big Piney Creek, and a reservoir 5 miles from the city.

## Fort Worth to Double Capacity of Filtration Plant

The city of Fort Worth, Tex., is planning to enlarge the capacity of its water-filtration plant from 20 to 40 m.g.d. Hawley, Freese & Nichols, Fort Worth, have been retained as consulting engineers on the work. The city and Tarrant County are now building a combined flood-control and water-storage project on the west fork of Trinity River. Dams at Eagle Mountain and Bridgeport will provide additional storage capacity of 1,500,000 acre-ft., about 43 times the storage capacity of Lake Worth, the present source of water supply for the city. Hawley, Freese & Nichols are also consultants on this project.

## Montreal to Vote on $4,250,000 Public Improvement Program

A referendum of proprietors of Montreal, to be held about Nov. 1, will be held to authorize public works totaling $4,250,000. The main items to be included in the referendum are: incinerator in the southwest area; subway under the Canadian Pacific Ry. tracks at Girouard Ave.; subway under Canadian Pacific Ry. tracks at the north end of Decarie Blvd.; subway under the Lachine Canal; subways under the Canadian Pacific Ry. tracks at St. Hubert St., and possibly at Papineau Ave.; fire stations in three wards; installation of traffic signal lights at 50 corners in the heart of the city, and parks and playgrounds in various parts of the city.

## Vancouver Docks to Cost $4,000,000

Plans for a 1,200-ft. pier are being prepared by the Vancouver harbor commissioners by two engineers, W. G. Swan and Sydney E. Junkins, at an estimated cost of $4,000,000. No decision has been made regarding the type to be adopted, this resting with the department of marine at Ottawa, but it is assured that they will be of fireproof construction.

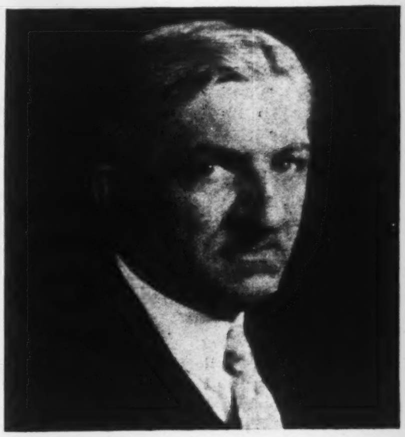
Reconstruction plans are also in the making for the dock of the Canadian National Railways, which was destroyed by fire recently. This structure, which will cost about $1,000,000, will be about the same size as the one destroyed, which was 1,000 ft. long by 220 ft. wide. This also will be fireproof.

## New Bridge in Quebec

A bridge 800 ft. long is to be built across the mouth of Gaspe Basin in the Province of Quebec, connecting the town of Gaspe with the harbor. The provincial minister of public works has been authorized to sign a contract with the Gaspe Bridge Co. for the erection of the bridge, which will cost about $500,000.

## C. H. Stevens Heads City Transit Department, Philadelphia

Charles H. Stevens, engineer of design in the department of city transit, Philadelphia, has been appointed chief engineer of the department to succeed the late Frank R. Fisher.



CHARLES H. STEVENS

Mr. Stevens, who was born in 1875 in Harrisburg, Pa., as chief draftsman of the department of city transit had charge of the detailed work of preparing plans and specifications for the various rapid transit lines. In 1924, after a revision of the earlier routes had been determined and appropriations made available for the construction of the initial section of the Broad St. subway as a four-track structure about 6½ miles long, the department was reorganized and Mr. Stevens was made engineer of design. Plans for a number of major extensions of the city's rapid transit lines and for the substitution of a subway for the existing elevated line in Market St. west of the Schuylkill River and under City Hall are being developed under Mr. Stevens' direction concurrently with work under contract totaling substantially $30,000,000.

## Road Builders Manufacturers' Division Plans Committee Work

To discuss and complete arrangements for committee activities and to determine manufacturers' representation on these committees, the manufacturers' division of the American Road Builders Association has called a series of meetings during the week of Sept. 7 in Washington, D. C. The meetings are scheduled as follows: Sept. 9, 10 a.m., snow removal committee; 2:30 p.m., survey of needs for and availability of maintenance equipment committee. Sept. 10, 10 a.m., traffic control signals committee; 2:30 p.m., central and transit mixed concrete committee. Sept. 11, 10 a.m., power requirements for operation of various types of road machinery committee; 2:30 p.m., guard rail committee.

# WASHINGTON NOTES

By Paul Wooton

*Washington Correspondent*

### St. Lawrence Waterway Project May Have Received New Impetus —Levee Contracts Are Protested

CANADA'S overturn in government has not upset plans for a St. Lawrence waterway but rather has pushed the project forward with renewed impetus. During the election both Premier Bennett and former Premier King favored the development. The new group has shown that it meant something by its campaign pledge when it appointed as minister of railways and canals R. J. Manion, one of the most prominent figures in the Canadian Conservative party next to the premier. Ordinarily this portfolio is a routine job unless some exceptional work is in prospect. It is generally believed that the appointment of Mr. Manion assures prompt action on the St. Lawrence. A revised report of the engineering facilities has been submitted by the joint board of engineers between the two nations. Some formal move on the part of Canada toward actually starting the work is foreseen by many observers close to the situation.

### Contract for Levee Work at Vicksburg Protested

The decision of the army engineers to take over and award to other contractors some levee setback work in the Vicksburg district is being vigorously protested by the Orleans Dredging Co., which received the original contract. When the work was taken over and readvertised, it developed that the United Dredging Co., which is connected with the Orleans company, put in the low bid. Despite this, the army engineers in charge of the procedure awarded the work to the Canal Construction Co.

It is claimed by engineer officers that interests controlled by the same organization that controls the Orleans company would use the same type of equipment and would therefore be subject to the same delay in completing the job. The reason assigned for taking over the work is that it would not be finished on contract time, which is Dec. 5. The basic issue in the controversy concerns the use of floating clamshell dredges in Mississippi flood-control work. The Orleans company, which uses these dredges, contends that the specifications drawn up by the army engineers are obsolete and discriminate against the clamshell type of equipment.

### Pipelines Receive Setback

Utilization of pipelines in the oil business has received a setback by the decision of the Continental Oil Co. to build a 100-acre refining plant at Kansas City rather than to extend its pipelines from the midcontinental district to refineries along the Great Lakes. Before definitely deciding to pipe the oil to refineries in Chicago for distribution, officials of the company gave consideration to the facilities offered by the federal barge line which soon will be extended up the Missouri River. As a result, the Inland Waterways Corporation has been notified that the refinery will be built on a site adjacent to the river. The oil company will provide its own tank barges but will have them hauled by the towboats of the government barge line.

## Brief News

Railroad Traffic Returns made public by British railroads reveal an aggregate decrease in this year's earnings of approximately $26,785,000.

Completion Is Announced of the dam across the Rita Bianca Canyon, southwest of Dalhart, Tex. The dam is situated on the site of the Blair dam, which failed during the flood of 1908.

A Steel Reservoir with a capacity of 250,000 gal. has been erected at Coleman, Tex., and the old reservoir, which has served the city for many years, will be reconstructed and placed in use again. The filtration plant at Lake Scarborough, about 8 miles north of Coleman, will be completed about Sept. 15.

A Petition has been filed by 4,000 taxpayers of Teaneck, N. J., four times as many as necessary, for a referendum on the adoption of a municipal manager plan of government to replace the present township organization. The referendum vote will be taken on Sept. 16. Teaneck has 7,300 registered voters.

For City Manager of Painesville, Ohio, the city council has received 44 applications. George R. Moody, formerly head of the city gas department, has been appointed temporary city manager until the selection of a permanent official to succeed Roger M. Evans, who has resigned to become city manager of Dubuque, Iowa.

Announcement Is Made that *Building Age*, published in New York by National Trade Journals, Inc., and established in 1879, and *American Builder*, Chicago, published by the American Builder Publishing Corporation, a subsidiary of the Simmons-Boardman Publishing Corporation and established in 1905, will be merged, effective with the October issue of the latter, under the name of *American Builder and Building Age*.

Acceptance of the Bid of the Canadian Bridge Co., of Walkerville, Ont., for the erection of the steel superstructure over the Ottawa River of the Hawkesbury-Grenville bridge has been recommended to the government by the dominion department of public works. The bid of the Canadian company was the lowest, $186,715.

A State Survey of the Muskigum and Tuscarawas rivers for which the State of Ohio has authorized an expenditure of $10,000 will be started at once. The work will be done by the Morgan Engineering Co., of Dayton. The state survey will supplement a federal survey designed to unite the two rivers with the Mississippi flood-control program, and has for its object the improvement of navigation, water conservation and flood control between Akron and Marietta.

### *The Business Outlook*

**After about two weeks' delay due to the drought scare, the signals of the beginning of definite business recovery begin to flicker faintly. Nearly every important weekly indicator has turned upward this week, while a year ago almost all were sliding steadily down. Steel activity, coal production and car loadings are up more than seasonally; electric power output is increasing slowly; building is resisting seasonal decline. Although commodity prices continue to show irregularity, it is clear that the rapid and general decline of the past year has been halted. Resumption of a high rate of bank credit is a further favorable indication.**

***—The Business Week, Sept. 3.***

Building Permits have been issued at Fort Worth, Tex., to the Texas & Pacific Railroad Co. for a new passenger station, to cost $1,342,899, and for a new freight terminal, to cost $1,605,529.

The Waterworks Expansion Program of Big Spring, Tex., involving an outlay of $115,000, will be started soon, according to an announcement by V. R. Smitham, city manager.

## Society Calendar

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, New York City; Pinehurst, N. C., Oct. 27-28.

AMERICAN IRON & STEEL INSTITUTE, New York City; semi-annual meeting, New York City, Oct. 24.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; fall meeting, St. Louis, Mo., Oct. 1-3.

AMERICAN WELDING SOCIETY, New York; fall meeting, Chicago, Sept. 22-27.

ASPHALT PAVING CONFERENCE, New York City; ninth annual conference, Memphis, Tenn., Dec. 1-5.

INTERNATIONAL ROAD CONGRESS; Washington, D. C., Oct. 6-11.

NATIONAL SAFETY CONGRESS, Chicago; annual meeting, Pittsburgh, Pa., Sept. 29-Oct. 3.

NEW ENGLAND WATER WORKS ASSOCIATION, Boston, Mass., annual convention, Atlantic City, N. J., Sept. 23-26.

AMERICAN ROAD BUILDERS ASSOCIATION will hold its 28th annual convention and road show in St. Louis Jan. 12-16.

NATIONAL CRUSHED STONE ASSOCIATION has decided to hold its next convention in St. Louis on Jan. 19.

NATIONAL SAND AND GRAVEL ASSOCIATION will hold its next meeting in St. Louis Jan. 27-29.

## Personal Notes

H. W. Bashere, construction engineer in charge of the Vale irrigation project, Oregon, will be relieved of that assignment and sent to Spokane within a month to take charge of the Columbia basin field operations.

A. L. Scott, who was until recently employed as resident engineer on bridge construction by the Alabama State Bridge Corporation, has accepted an appointment as assistant engineer in the valuation department of the Interstate Commerce Commission and at present is located at Savannah, Ga.

Adelbert Diefendorf, head of the department of civil engineering at the University of New Mexico, has resigned to join the faculty of the University of Pittsburgh, where he will be assistant head of the civil engineering department. Professor Diefendorf is secretary and treasurer of the New Mexico section of the American Society of Civil Engineers.

O. N. Floyd, of the engineering firm of Floyd & Lochridge, Dallas, Tex., will give much of his time for the next six months to the Bonnet Carré spillway flood-relief project in New Orleans as consulting engineer to the United States Army engineers. Mr. Floyd was consulting engineer on the $40,000,000 flood-control project at Dayton, Ohio, and was supervising engineer on the construction of Garza dam for the city of Dallas.

## Obituary

Walter Leo Haigley, a member of the firm of Frainie Bros. & Haigley, Baltimore builders, died on Aug. 30 at his home in Baltimore. Mr. Haigley was prominently identified with the construction business in Baltimore for many years. In 1912, after he had been associated with Edward Brady & Son for 25 years, he became a member of that firm. He became a member of the firm of Frainie Bros. & Haigley in 1917. Mr. Haigley was a member of the Builders Exchange, Associated General Contractors and the Baltimore Engineers Club. He was associated with the construction of a number of important buildings in Baltimore, including the Union Memorial Hospital, Gilman Hall and dormitories of Johns Hopkins University, the Baltimore Sun Building, Knights of Columbus Hall and Mount St. Agnes' High School.

James R. Ferris, an assistant division engineer of the New York City board of transportation, was killed on Sept. 2 in an automobile accident near Norwich, N. Y. Mr. Ferris, who was 56 years old, entered the city service in 1901 as an engineering assistant in the aqueduct commission, and in 1902 went with the board of rapid transit commissioners. After serving with the old public service commission and the transit commission he was transferred to the board of transportation in 1925. He was secretary of the Municipal Engineers, City of New York.

# *Construction Equipment and Materials*

## Trade Association Executives Plan Convention

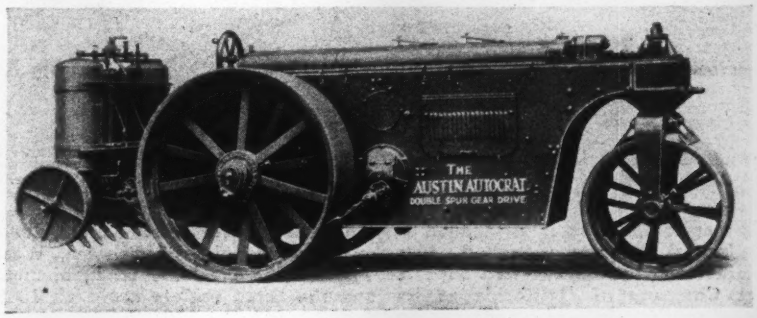
The part of the trade association in bettering business conditions will be the principal subject to be considered at the eleventh annual convention of the American Trade Association Executives, to be held at Niagara Falls, Ont., Sept. 24-27. The meeting will bring together managers, secretaries and other executives in charge of nearly all of the leading trade associations in the United States. A number of other trade bodies will hold meetings at Niagara Falls during the session.

## *New Developments*

### Three-Wheel Roller Driven by Double Spur Gears

Outstanding features of the new Austin Autocrat three-wheel roller, made in 10- and 12-ton sizes by the Austin-Western Road Machinery Co., Chicago, Ill., include a double spur gear drive, ample power, an unusually short wheelbase, easy steering and a low center of gravity. The power unit of this machine is a heavy-duty four-cylinder engine developing 57 b.hp. at 1,100 r.p.m. which is direct-connected to, and forms a single unit with, a heavy sliding gear transmission with forward and reverse clutches. The power unit is hung low in the frame, which results in a low center of gravity and makes the engine readily accessible from below as well as through doors in the frame plates. The sliding gear transmission is bolted directly to the engine bell housing. Transmission gears, of hardened alloy steel, are fully inclosed and run in oil back to and including the differential. No keys are used in the transmission; all connections are splined. The double-disk type of clutch is used because of its durability and simplicity of adjustment.

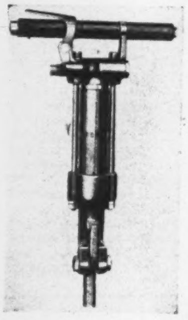
Optional equipment for the roller includes a wheel sprinkling system, driver's cab, power steering system, and electric starter for the motor. A pneumatic scarifier attachment is also available, the scarifier unit being raised or lowered by a pneumatic piston rigidly mounted on the rear of the machine. Air is provided by a four-cylinder water-cooled compressor, belt-driven from the transmission. This delivers air at the rate of 22 cu.ft. per minute to two storage tanks, where it is held at a pressure of 140 lb. per square inch.



IMPROVED ROAD ROLLER WITH SCARIFIER

### Light-Weight Paving Breaker

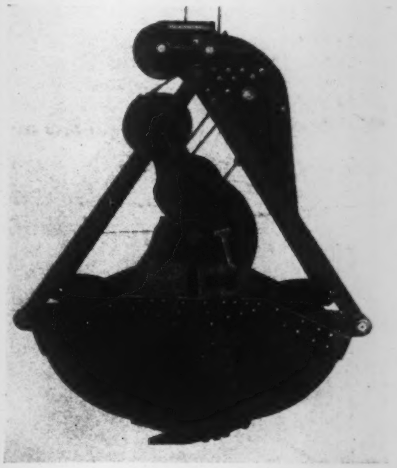
A 38-lb. paving breaker designed to meet the need for a demolition tool that is easy to handle is now being produced by the Ingersoll-Rand Co., New York City. This new tool, the L-54, is 14 lb. lighter than the next largest size, but compares favorably with it in power. For general demolition work it can be easily handled in a horizontal or upward sloping position where heavier tools are difficult or unhandy to use. It is more convenient and safer to use on scaffolding than larger sizes. It is effective as a spike driver and will put down a large railroad spike in four seconds. This new tool uses 1-in. hexagonal steel with a collared shank.



PAVING BREAKER

### Clamshell Bucket Improved

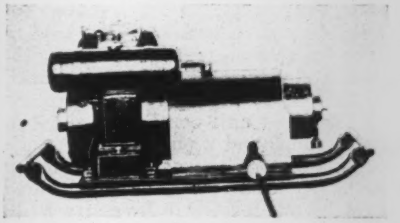
Increased strength and stability, with greater digging power and speed, are claimed by the G. H. Williams Co., Erie, Pa., for a new model Champion clamshell bucket which has been improved in many important details. Twisting strains are resisted by the use of cast-steel and rolled steel parts, and weaving or wabbling is prevented by a broader and more solid bearing surface for the return sheave pin. Additional digging leverage is given by extending the cast-steel brackets well beyond the backs of the scoops. These brackets also give a wabble-proof connection between scoops and the A-frame superstructure. The scoop itself is of all welded constructed with no obstructions to catch the material. The parts are hung from a one-piece full-width main hinge, which gives greatly reduced wear on the hinge pin.



CLAMSHELL BUCKET

### Compact Portable Unit Supplies Current for Small Tools

On many construction jobs portable electric tools, such as drills, hammers, saws and grinders, are not used because of the lack of a convenient supply of power. For such conditions the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., now supplies a portable gasoline engine-driven power plant weighing only 120 lb. and capable of delivering 1,000 watts. This plant is mounted on duralumin skids for easy transportation. There is only one exposed moving part, all others being inclosed in a sealed bath of oil. Power is provided by a single-cylinder, air-cooled, Briggs & Stratton gasoline motor with a speed range from 1,800 to 4,000 r.p.m. Engine speed is controlled by an automatic mechanical governor. The gasoline tank, of $2\frac{1}{2}$-qt. capacity, provides sufficient fuel for three hours



PORTABLE POWER PLANT

of full-load operation. The motor is connected by means of a flexible spring coupling to a Westinghouse direct-current generator, compound wound, which will deliver 1,000 watts d.c. at the end of 100 ft. of flexible cable.

## Twin Spirals Convey Materials

A new portable, flexible, power-driven elevating and tiering conveyor known as the TwinVeyor that has already found many useful applications in a wide range of industries is manufactured by the Clark Trucktractor Co., Battle Creek, Mich. This uses a new principle—two external spiral tubes are turned toward each other by a power head. Anything placed on the conveyor travels forward rapidly, perfectly balanced. Bags, bales, bundles, crates and boxes have been successfully handled. The equipment has been used for some years in sugar refineries in California and Hawaii, where it has achieved remarkable cost reductions. It is said to carry bagged sugar up a 30 per cent grade at the rate of 90 ft. per minute, handling 1,800 bags per hour.

CONVEYOR STACKING SUGAR BAGS

A standard unit consists of six 8-ft. dual sections and a power head. Each section joins to the assembly with an automatic lock. It is easily shifted about by one man, and the entire 50-ft. line can be assembled or disassembled in six minutes. Flexibility is secured by the ability of any joint to take a 15 deg. angle horizontally, or it may be tilted 15 deg. up or 10 deg. down. In the elevating operation, sections may be supported by the material that has already been stacked. A hurdle section permits any number of TwinVeyor units to be hooked together, forming a continuous line of any desired length. The traveling load hurdles each power head in the line. Right and left spiral chutes are provided for shunting the load from one TwinVeyor line to another without manual handling, thus making right-angle turns simple.

An extension cord attached to the power head may be plugged into any power line. The flow of power along the entire TwinVeyor is smooth and constant. Two complete 50-ft. TwinVeyors, dissembled in fifteen minutes, can be loaded onto one factory trailer. Power head sections weigh 365 lb., each 8-ft. dual section 140 lb., an entire 50-ft. assembly 1,205 lb.

## *New Publications*

*Traveling Screens*—Book 1252 of the Link-Belt Co., Chicago, Ill., describes the improved "Clean Water" traversing intake screens manufactured by the company.

*Water Purification*—How pure water can be obtained from the ocean at low cost by means of the Lea distillation process is told in a 14-p. booklet published by Henry I. Lea, Santa Monica, Calif.

*Construction Equipment*—The large variety of construction machinery produced by the six divisions of the National Equipment Corp., Milwaukee, Wis., is described and illustrated in a 36-p. catalog M-5. A separate publication of 43 pages is devoted to the Koehring line of pavers.

*Graders*—Caterpillar Tractor Co., San Leandro, Calif., has issued a 32-p. illustrated booklet and a large broadside describing the new model 60 leaning wheel grader.

*Electrical Equipment*—Recent publications of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., include the following: Welding—Automatic arc welding data bulletin 14, describing a number of automatic arc-welding applications and comparing costs for hand and automatic welding; "Arc Welding of Structural Steel," a 32-p. booklet on the strength of welded joints, design data, test and inspection data, building codes, estimating costs and bridge specifications; and a leaflet describing the Flex-Arc welding electrode, a recently announced general purpose steel-welding electrode. Transportation equipment—Special publication 1873, a 28-p. illustrated booklet on the performance, electrical and mechanical construction of seventeen mine locomotives and seven industrial locomotives of the trolley and storage battery type; special publication 1880 on oil electric locomotives and rail cars, which contains five sections devoted to a general description of these units, selection of equipment, oil electric power plants, rail car data and locomotive data, the latter two including photographs and specifications of nineteen oil locomotives and rail cars. Power transmission equipment—Two circulars describing Westinghouse-Nuttall flexible couplings and speed reducers. Motors—A leaflet describing the type CW wound rotor induction motor for general industrial applications.

*Electrical Equipment*—Among recent publications of the General Electric Co., Schenectady, N. Y., are the following: Illustrated booklets on the arc welding of structural steel, centrifugal compressors, airport illumination and the Selsyn system of remote signaling, control, and indication; catalog leaflets on atomic-hydrogen arc-welding equipment, industrial haulage locomotives and miscellaneous electrical apparatus including controllers, starters, resistors, switches, thermostats, photoelectric relays and motors.

*Rubber*—Linatex, a resilient abrasion resisting rubber with many uses in mining and general engineering, is described in a 24-p. booklet of the Wilkinson Process Rubber Sales Corp., 53 West Jackson Blvd., Chicago, Ill.

*Automatic Arc Welding*—"Automatic Arc Welding by the Electronic Tornado Process" is the title of a 40-p. booklet issued by the Lincoln Electric Co., Cleveland, Ohio. This contains information on automatic welding with the carbon arc. Results of test of strength and ductility are tabulated and described. Other pages show the application of the process in various industries and give results in speed and cost attained by automatic welding.

*Brick*—Two recent publications issued by the Common Brick Manufacturers Association of America, Cleveland, Ohio, are of special interest to architects and builders. These are: "Contemporary Detail in Common Brick" and "Brickwork Specifications." The former, in loose-leaf form, reproduces pictorially many interesting examples of artistic construction with brick as the medium of expression.

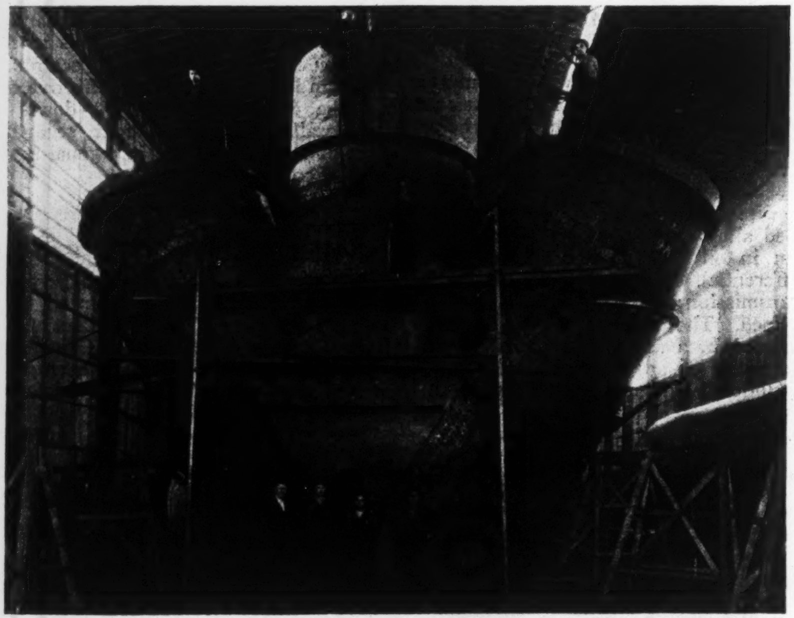


*Photo from Western Pipe & Steel Co. of California*

**LARGEST MANIFOLD**

**This manifold, which it is claimed is the largest ever constructed, was manufactured by the Western Pipe & Steel Company of California at its South San Francisco plant for use on the Cushman No. 2 power plant, developed by the city of Tacoma, Wash. The largest end is 17 ft. in diameter and the three outlets are each 10 ft. 6 in.**

# The Business Side of Construction

## August Contracts Above July, but Below Last Year

ENGINEERING construction contracts were awarded in August at the rate of 60 million dollars per week, compared with 53 millions in July and 70 millions in August, 1929. Public works accounted for 43.4 per cent of the total, compared with 37.8 a year ago. The average for the 35 weeks of 1930 is 12.4, compared with 11.5 in that period of 1929 and 10.35 for the whole of that year.

Streets and roads averaged 12.3 millions, compared with 14.6 in July and 16.5 millions in August, 1929. Other classes ahead of last August are sewers, excavation, and unclassified structures, both private and public. All sections of the country, except the Middle Atlantic and Far Western states, record a larger volume than a month ago.

For the eight months only New England is ahead of last year. The total drop is 19 per cent. Private construction is down 30 per cent; public up 5 per cent.

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## Unemployment Continues, but Wage Rates Are Unchanged

Union labor in August was 22 per cent unemployed, compared with 9 per cent a year ago, according to the American Federation of Labor. In the building trade the figure was 39 per cent, compared with 40 per cent in July and 19 per cent in August, 1929.

Unemployment is most severe, according to census figures issued Aug. 23, in Michigan, where the proportion of unemployed to total population amounts to 3.3 per cent. Following are Rhode Island and New Jersey, with 3.2; Illinois and Nevada, 3.1; California, 3. Unemployment was lowest in Mississippi and South Dakota, 0.5; South Carolina and Arkansas, 0.7; Tennessee and Alabama, 0.8. As these are agricultural states where the drought has been severe, it is possible that returns on crops will not compensate for the higher employment rate.

The only important wage reduction in August was a cut of 10 per cent for both shop and office forces in the Goodyear Tire & Rubber Co., of Akron.

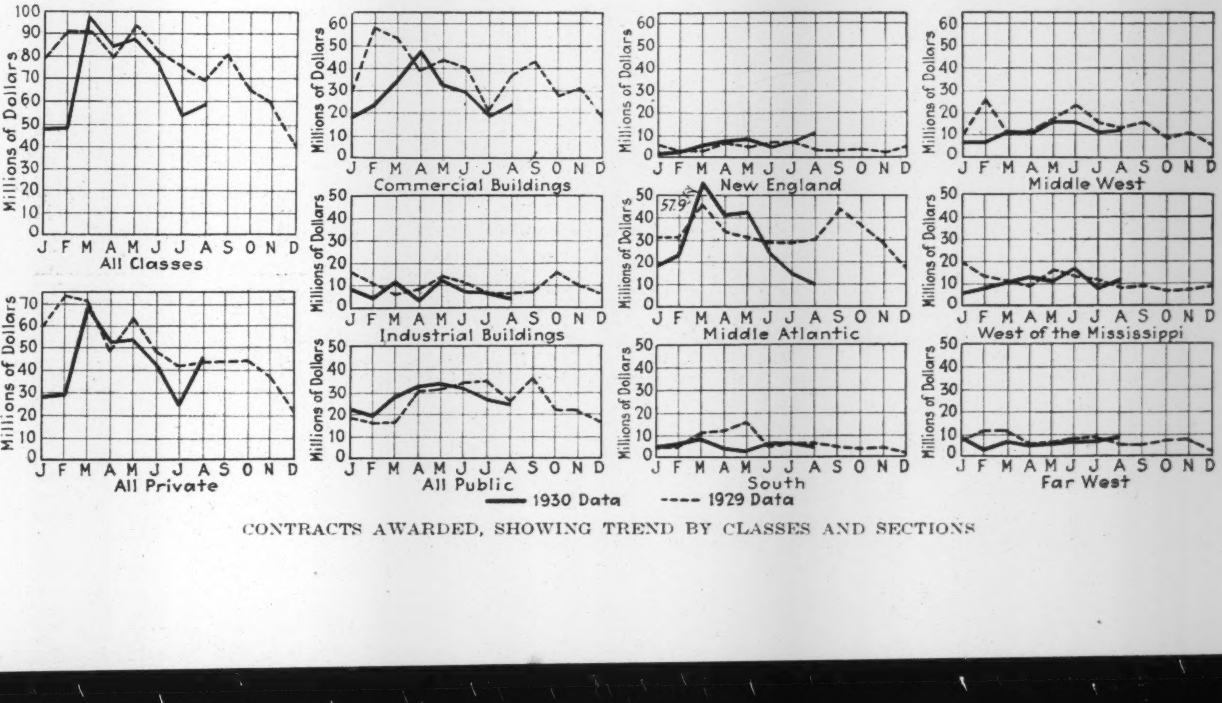
The situation locally is outlined below:

*Boston*—The board of trade claims, created July 31 to govern jurisdictional disputes, will become effective at the annual convention of the building trades department of the American Federation of Labor, to be held next month in Boston. This adjustment body consists of an equal number of representatives from the Federation and the National Association of Building Trades Employers and replaces the old jurisdic-

ENGINEERING CONSTRUCTION CONTRACTS REPORTED IN AUGUST, 1930

Thousands of Dollars (000 omitted)

| | New England | Middle Atlantic | South | Middle West | West of Mississippi | Far West | United States | | | Canada, August, 1930 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | August, 1930 | Eight Months | | |
| | | | | | | | | 1930 | 1929 | |
| Water-works | $321 | $290 | $396 | $54 | $907 | $113 | $2,081 | $32,057 | $29,989 | $1,244 |
| Sewers | 156 | $1,583 | 117 | 6,048 | 486 | 102 | 8,492 | 57,059 | 59,935 | 497 |
| Bridges, public | 862 | 903 | 582 | 2,482 | 1,464 | 369 | 6,662 | 72,711 | 62,861 | 829 |
| Excavation | 52 | 336 | 166 | 1,099 | 327 | 273 | 2,253 | 15,000 | 19,375 | 1,270 |
| Streets and roads | 3,424 | 10,994 | 11,750 | 9,446 | 9,218 | 4,409 | 49,241 | 436,058 | 386,614 | 976 |
| Federal government | 51 | 861 | 1,536 | 1,197 | 4,949 | 1,124 | 9,718 | 76,524 | 82,712 | ........ |
| Unclassified, public | 264 | 1,673 | 467 | 277 | 214 | 545 | 3,440 | 77,872 | 75,172 | 664 |
| Buildings, public | 4,407 | 7,505 | 271 | 6,522 | 1,464 | 1,185 | 22,121 | 208,431 | 208,552 | 727 |
| Total public | 9,537 | 24,145 | 15,285 | 27,125 | 19,796 | 8,120 | 104,008 | 975,712 | 925,210 | 6,207 |
| Buildings, industrial | 1,901 | 3,612 | 677 | 5,271 | 1,568 | 4,880 | 17,909 | 256,790 | 375,210 | 22,130 |
| Buildings, commercial | 36,135 | 12,706 | 2,037 | 9,610 | 8,508 | 7,702 | 76,698 | 751,268 | 1,248,670 | 982 |
| Bridges, private | 25 | 305 | ........ | ........ | 2,180 | ........ | 2,510 | 11,511 | 33,937 | 120 |
| Unclassified, private | 225 | 336 | 1,240 | 12,101 | 11,860 | 12,705 | 38,467 | 358,591 | 312,697 | 65 |
| Total private | 38,286 | 16,959 | 3,954 | 26,982 | 24,116 | 25,287 | 135,584 | 1,378,160 | 1,970,514 | 23,297 |
| **AUGUST TOTAL, 4 weeks** | **47,823** | **41,104** | **19,239** | **54,107** | **43,912** | **33,407** | **239,592** | ........ | ........ | **29,504** |
| July, 1930, 5 weeks | 31,339 | 73,375 | 27,679 | 53,393 | 44,258 | 33,413 | 263,457 | ........ | ........ | 14,123 |
| August, 1929, 5 weeks | 23,352 | 154,461 | 34,651 | 70,770 | 40,221 | 26,240 | 349,695 | ........ | ........ | 24,700 |
| 8 months, 1930 | 200,186 | 966,843 | 190,636 | 396,669 | 365,263 | 234,275 | ........ | 2,353,872 | ........ | 130,738 |
| 8 months, 1929 | 174,249 | 1,148,934 | 275,233 | 574,177 | 447,291 | 275,840 | ........ | ........ | 2,895,724 | 147,310 |



CONTRACTS AWARDED, SHOWING TREND BY CLASSES AND SECTIONS tional award board, abolished in 1927. Builders point out that the evolution of construction materials necessitates an adjustment body for eliminating disputes.

*Providence*—Plumbers are on the five-day week with a rise to $1.40 per hour, beginning this month.

*Albany*—There are 9,164 men employed by contractors in state highway work, compared with 8,338 at the beginning of summer. This increase of 9 per cent in highway employment compares with the proposed increase of 7 per cent in the state highway budget and an increase in street and road contracts reported for the state of 4 per cent.

*Syracuse*—Carpenters' union charges that contractors on viaduct projects are employing men at 90c. per hour, or 30c. below the prevailing rate. The Syracuse Grade Crossing Commission will try to settle the matter amicably.

*New York*—The city's free employment agency in a representative day's work (Aug. 25) placed 115 men. These were painters, carpenters, steam fitters, plumbers and farm hands.

*Brooklyn*—Board of Transportation will investigate charges that contractors on a section of Fulton St. subway are employing non-citizens and non-residents.

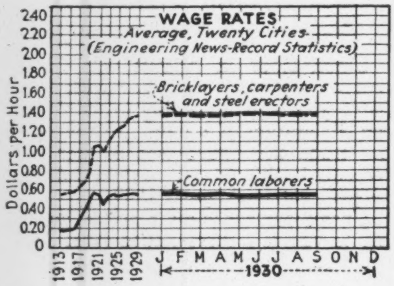
*Cleveland*—A few smaller contractors are employing below the rate, as follows: Carpenters, 85c. to $1.10 ($1.37½, union); plasterers, $1 to $1.25 ($1.67, union); laborers, 60c. to 70c. (87½c. union). The two methods of paying below scale appear to be: (1) Men sign receipts for regular scale and receive less in the envelope. (2) Men are paid full scale and make refund. Unemployment in the building trades increasing.

*Cincinnati* — Carpenters, concrete workers and common laborers are working below scale on some jobs.

Union scale for carpenters is $1.40, but union members on open-shop jobs are receiving 55c. to 85c. Union common laborers' scale is 40c. to 60c.; non-union laborers have received cuts on some road jobs from 60c. to 45c. per hour.

*Detroit* — Reopening of automotive plants after mass vacation offers no new vacancies and employers hope outsiders will not be drawn to the city. The five-day week has spread throughout the industrial plants of Michigan.

*Minneapolis* — Building trade wages unshaken except in cases of some smaller contractors. In absence of large projects, the large contractors are forced to bid on smaller jobs, with results to be looked for in a month or two.



*St. Louis*—Some 30 per cent of building trades mechanics unemployed or on part time and slack farm work has brought excess of common laborers. Public improvements are below last year's volume because of rejection by city of projects to be financed by special tax bills. Strike of 3,000 plumbers ended Aug. 18 with agreement to arbitrate, men having demanded that 4- and 6-in. pipe be cut and threaded on job instead of at mill and that sons of plumbers be given preference in selection of apprentices.

*Denver*—Three contractors charged by state Federation of Labor with violation of law governing more than eight hours' work per day on state projects.

*Birmingham*—Increased employment in common labor, but many building craftsmen are out of work.

*Dallas*—Bidders on sanitary sewer work must agree to pay prevailing rate of 40c. per hour minimum if awarded contract.

*Canada*—In Montreal employment on municipal contracts will be limited to taxpayers. Unemployment among Toronto's skilled building trades mechanics is 25 per cent, compared with a normal of 5 per cent, with little work in sight. In Quebec, road workers' wages were advanced 50c. per day, to $3.50; man and horse, $4.50; man and team, $5.50. Record number now employed by road department.

*Wage Rates*—Skilled building crafts, $1.39⅓ per hour, against $1.39 in August and $1.37 in September, 1929. Common laborers, 56.09c. per hour, compared with 56.15 in August and 54.96c. in September, 1929. The skilled rate in manufacturing is 66.8c. per hour, unskilled 49.5c.

CURRENT BUILDING AND CONSTRUCTION TRADES WAGE RATES PER HOUR

Advances since last month are indicated by **heavy type**, declines by *italics*

| Cities | Bricklayers | Carpenters | Hoisting Engineers | Hod Carriers | Pile Drivers | Structural Iron Workers | Common Labor* |
|---|---|---|---|---|---|---|---|
| Atlanta | $1.25@1.40 | $0.60@.70 | $0.60@1.00 | $0.50 | .......... | $0.75@1.25 | $0.25@.35 |
| Baltimore | 1.75 | 1.00@1.10 | 1.00@1.37½ | 1.00 | $0.65 | 1.00@1.25 | *.30* |
| Birmingham | 1.50 | 1.00 | 1.25 | .50 | .......... | 1.25 | .20@.35 |
| Boston | 1.50 | 1.37½ | 1.37½ | .85 | 1.27½ | 1.37½ | .45@.80 |
| Cincinnati | 1.62½ | 1.40 | 1.40 | 1.00 | 1.40 | 1.40 | .40@.60 |
| Chicago | 1.70 | 1.62½ | 1.62½ | .97½ | 1.62½ | 1.62½ | .97½ |
| Cleveland | 1.62½ | 1.37½ | 1.37½ | .87½ | 1.10 | 1.50 | .40@.87½ |
| Dallas | 1.87½ | 1.12½ | 1.25 | .35 @ .75 | 1.25 | 1.37½ | .35@.50 |
| Denver | 1.50@1.62½ | 1.25 | 1.25@1.37½ | .87½@1.00 | .......... | 1.25 | .62½ |
| Detroit | 1.56¼ | 1.00@1.25 | 1.00@1.10 | .90 | 1.00@1.10 | 1.00@1.25 | .50@.60 |
| Kansas City | 1.50 | 1.37½ | **1.37½** | .90@**1.00** | *1.25*@1.37½ | 1.37½@**1.50** | *.35*@*.60* |
| Los Angeles | 1.37½ | 1.00 | 1.00 | .75 | .87½ | 1.00 | .50 |
| Minneapolis | 1.30 | .90 | .90@1.00 | .80 | .......... | 1.00@1.25 | .50@.65 |
| New Orleans | 1.50 | .90 | 1.25 | .75 | .80@1.00 | 1.25 | .30@.40 |
| New York | 1.87½ | 1.65 | 1.92½ | 1.18¾ | 1.10@1.23¾ | 1.92½ | 1.03½ |
| Philadelphia | 1.75 | 1.50 | 1.02½ | .70@1.12½ | 1.00 | 1.37½@1.50 | .40@.50 |
| Pittsburgh | 1.75 | 1.50 | 1.43¾@1.56¼ | 1.12½ | .......... | 1.50 | .40@.80 |
| St. Louis | 1.75 | 1.50 | 1.60@1.75 | 1.15@1.25 | 1.50 | 1.75 | .40@.87½ |
| San Francisco | 1.37½ | 1.12½ | 1.12½ | .87½ | 1.12½ | 1.37½ | .68¾ |
| Seattle | 1.50 | 1.12½ | 1.12½@1.25 | 1.00 | 1.12½ | 1.25 | .70 |
| Average | 1.59 | 1.23 | 1.25 | 0.8818 | 1.16 | 1.36 | 0.5609 |
| Montreal | 1.25 | .80 | .75 | .......... | .90 | 1.00 | .30@.35 |

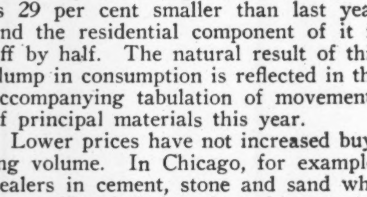
*Minimum rates are non-union and for construction other than buildings.

## Prices Continue Downward

Commodity prices, including those of building materials, continue downward because of slack building, and the only group for which higher prices are predicted is foods, because of scarcity caused by the drought. Total building is 29 per cent smaller than last year and the residential component of it is off by half. The natural result of this slump in consumption is reflected in the accompanying tabulation of movements of principal materials this year.

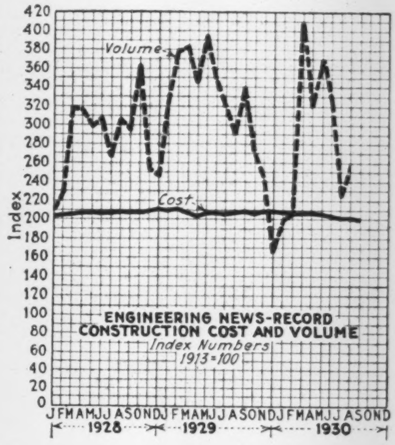
Lower prices have not increased buying volume. In Chicago, for example, dealers in cement, stone and sand who have reduced their prices close to cost have now restored them to July levels. Even so, gravel which sells for $2 per cubic yard costs the dealer $1.90 on the job. Construction in the Chicago territory is 35 per cent below last year, although public works and utilities contracts are 37 per cent above. The falling off is, as usual, in buildings: 66 per cent in residential and 44 per cent in other buildings.

Though few price changes were reported in brick, shipments are a third smaller than last year and stocks are almost that much larger. Of 208 plants reporting to the Common Brick Manufacturers Association, 69, or 33 per cent,



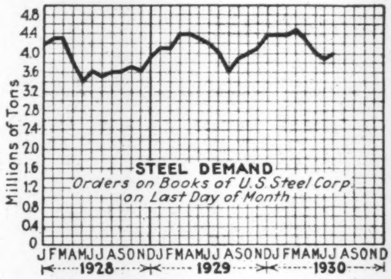
## Construction Cost and Volume Index Numbers

The drop of 1.37 points (0.6 per cent) in costs was caused by a 5-cent drop in the price of structural steel and a slightly lower average wage rate. The index is lowest since February, 1923. Volume is 14.6 per cent above that of July but 10.6 below that of August, 1929.



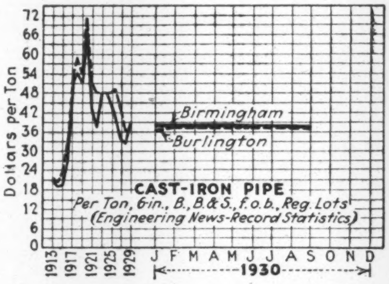
| **E. N.-R. Cost** | | **E. N.-R. Volume*** | |
|---|---|---|---|
| **Sept., 1930** | **199.58** | **Aug., 1930** | **259** |
| August, 1930 | 200.95 | July, 1930 | 226 |
| Sept., 1929 | 207.57 | August, 1929 | 290 |
| Peak, June, 1930 | 273.80 | 1929 (average) | 317 |
| 1929 (average) | 207.02 | 1928 (average) | 287 |
| 1913 (average) | | | 100.00 |
| 1929 | | 1929 | |
| January | 209.40 | January | 325 |
| February | 210.40 | February | 378 |
| March | 207.78 | March | 382 |
| April | 203.40 | April | 332 |
| May | 205.15 | May | 395 |
| June | 205.65 | June | 347 |
| July | 204.77 | July | 320 |
| August | 205.91 | August | 290 |
| September | 207.57 | September | 340 |
| October | 206.32 | October | 273 |
| November | 208.46 | November | 245 |
| December | 209.46 | December | 166 |
| 1930 | | 1930 | |
| January | 208.96 | January | 199 |
| February | 206.46 | February | 204 |
| March | 206.80 | March | 408 |
| April | 207.12 | April | 320 |
| May | 205.86 | May | 354 |
| June | 203.36 | June | 324 |
| July | 200.95 | July | 226 |
| August | 200.95 | August | 259 |
| September | 199.58 | | |

*Corrected for price change since 1913.

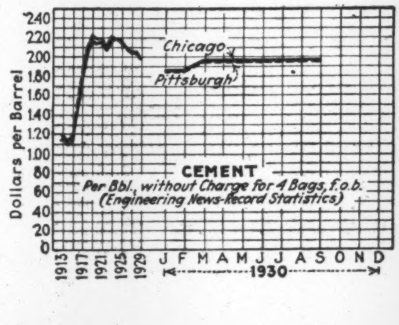


are not operating. There are plants, say the producers, that though idle for more than a year still have brick to sell. The American Face Brick Association reports a machine capacity of only 36 per cent in use, compared with 63 per cent in July last year.

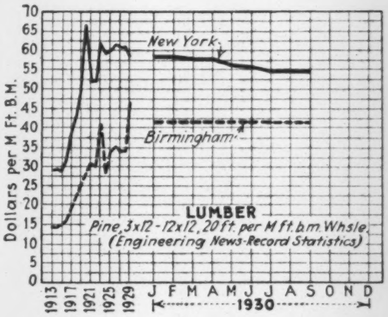
One year ago cement mills were cutting 10c. to 30c. per barrel and blaming imports for it; prices have been steady all this summer. Dealers face increasing competition from ready-mixed concrete concerns, which buy in mill lots, as do the dealers. The only price change in August was a drop of 10c. per barrel, to $2.10 net, in Toledo. Production in July was 17,080,000 bbl., and 17,310,000 a year ago; shipments 20,147,000 and 20,319,000.



Lumber reserves are found chiefly at the mills, as dealers have reduced shed stocks to a safe point. Mill books show unfilled orders for only 19.5 per cent of stock, compared with 36.3 per cent a year ago. The prolonged effort of the industry to hold down production to consumption seems to have blown up because of the large number of small sawmills acting on their own. Except in the Pacific Northwest and in the California redwood region, production has exceeded sales. The new tariff rate of $1 per 1,000 ft.b.m. on sawed spruce lumber appears not to have been prohibitory to Russian shippers, as American producers have invoked the "forced labor" clause of the law in the belief that the imported material is produced by convicts. The National Lumber Manufacturers Association finds Russian spruce in competition with Douglas fir, with the price for spruce, f.o.b. dock at Providence, $25 per 1,000 ft. and domestic fir $45.

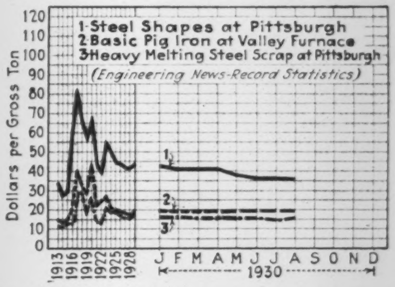


Smaller consumption with unchecked production will continue and this together with cheaper freight rates due to steamship competition will tend to ease prices of lumber. Pine 3x12 is down $1.50 at Detroit; $2 at Minneapolis. Fir timbers are down 50c. at Kansas City, $1 at Detroit, $2 in Minneapolis and $3 in Los Angeles. Oak railway ties are down 6c. and pine 17c. at Chicago, in keeping with the generally lighter calls for railroad material.



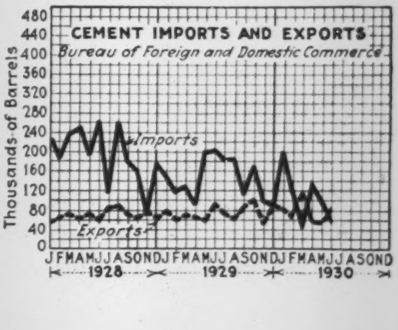
As a consequence of the steel mills having consumed the scrap piles, heavy melting grades rose 50c. per ton last week, the second rise in two weeks. It is traditional at the steel mills that a rise in scrap forecasts an increase in demand for steel. Prices of reinforcing bars have advanced 10c. to $1.70, and structural shapes have dropped 5c. to $1.60, Pittsburgh. Year ago prices were $2.05 for reinforcing bars and $1.95 for shapes.

Inquiries have increased for standard pipes used in buildings, but line pipe is still the principal type in demand. Pipeline contracts reported by *Engineering News-Record* in the four months, April to August, totaled $138,000,000 in 1930, compared with $55,000,000 in 1929 and $9,650,000 in 1928.



Prices of gypsum products are steady. Freight movements of sand, gravel and stone and other paving materials in Illinois, Iowa, Wisconsin and Indiana districts are said to be heavy for the season, with prices level. Sales of Indiana limestone are ahead of 1929 and quarries are active.

The heavy Argentine flaxseed crop has not yet affected linseed oil prices. Lead producers have guaranteed against price declines to Nov. 30, 1930, dealers' purchases of red, white or blue lead in kegs, thus protecting the dealers' profit from Aug. 1. Because of dry weather, paint sales have been fair this summer, but advance orders for paints are smaller for the season than in the last ten years.



# Current Prices of Construction Materials

Price advances since last month are indicated by **heavy type**; declines by *italics*

## Building Materials

**PORTLAND CEMENT**—Prices per barrel, *without charge for bags*, cash discount not deducted. Prices are delivered by truck to contractors, except those marked F.O.B., which are manufacturers:

| | Sept. 4, 1930 | One Mo. Ago | One Yr. Ago |
|---|---|---|---|
| Atlanta | $2.49 | $2.49 | $2.35 |
| Baltimore | 2.60 | 2.60 | 2.40 |
| Birmingham | 2.60 | 2.60 | 2.60 |
| Boston | 2.40 | 2.40 | 2.25@2.35 |
| Dallas | 2.15 | 2.15 | 2.15 |
| Denver | 2.61 | 2.61 | 2.55 |
| Jersey City | 2.60 | 2.60 | 2.60 |
| Kansas City | 2.60 | 2.50 | 2.65 |
| Los Angeles | 1.92 | 1.92 | 2.32 |
| Montreal | 2.20 | 2.20 | 1.70 |
| New Orleans | 2.65 | 2.65 | 2.65 |
| New York | 2.10 | 2.10 | 2.10 |
| Philadelphia | 2.10 | 2.10 | 2.40 |
| St. Louis | 2.45 | 2.45 | 2.45 |
| San Francisco | 2.64 | 2.64 | 2.41 |
| Seattle | .... | 2.70 | 2.70 |
| (F.O.B.) | | | |
| Cedar Rapids | 2.23 | 2.23 | 2.04 |
| Chicago | 1.95 | 1.95 | 1.85 |
| Cincinnati | 2.14 | 2.14 | 1.92 |
| Cleveland | 2.04 | 2.04 | 1.94 |
| Davenport | 2.14 | 2.14 | 2.04 |
| Detroit | 1.95 | 1.95 | 1.95 |
| Duluth | 2.04 | 2.04 | 1.84 |
| Indianapolis | 1.99 | 1.99 | 1.89 |
| Milwaukee | 2.10 | 2.10 | 2.00 |
| Minneapolis | 2.27 | 2.27 | 2.02 |
| Peoria | 2.12 | 2.12 | 2.02 |
| Pittsburgh | 1.95 | 1.95 | 1.85 |
| St. Paul | 2.27 | 2.27 | 2.02 |
| Toledo | *2.10* | 2.20 | 2.03 |

Current mill-prices per barrel, in carloads, without bags, f.o.b.:

| | | | |
|---|---|---|---|
| Alpena, Mich | $1.65 | Limedale, Ind | $1.70 |
| Buffington, Ind | 1.70 | Mason City, Ia | 1.85 |
| Clinchfield, Ga | 2.10 | Norfolk, Va | 1.90 |
| Hannibal, Mo | 1.80 | Northampton, Pa | 1.75 |
| Houston, Tex | 1.95 | North Birmingham, Ala | 1.70 |
| Hudson, N. Y | 1.85 | Richard City, Tenn | 2.05 |
| Ironton, Ohio | 1.75 | Steelton, Minn | 1.85 |
| Iola, Kan | 1.85 | Universal, Pa | 1.70 |
| La Salle, Ill | 1.80 | Wyandotte, Mich | 1.70 |

**SAND AND GRAVEL**—Per ton, delivered by dealers. Weight of sand per cu.yd., 1⅓ tons; gravel, 1½ tons, unless otherwise specified in pounds:

| | Gravel | | Sand |
|---|---|---|---|
| | 1½ In. | ¾ In. | |
| Atlanta | $2.60 | $2.60 | $2.15 |
| Baltimore, per cu.yd | 2.40 | 2.60 | 1.70 |
| Birmingham, per cu.yd., 2,600 lb | 3.50 | 3.50 | 3.00 |
| Boston | 1.75 | 1.75 | 1.15] |
| Chicago, per cu.yd | 2.00 | 2.00 | 2.00 |
| Cincinnati | 1.75 | 1.75 | **2.25** |
| Cleveland, per cu.yd., 3,000 lb | 2.60 | 2.60 | 2.50 |
| Dallas, per cu.yd., 2,700 lb | 3.00 | 3.00 | 3.00 |
| Denver, per cu.yd., 2,700 lb | 1.95 | 1.95 | 1.35 |
| Detroit | 2.50 | 1.85 | 1.65 |
| Kansas City | 2.00 | 2.00 | 2.00 |
| Los Angeles | 1.40 | 1.40 | 1.00 |
| Minneapolis, per cu.yd., 2,800 lb | 2.40 | 2.40 | 1.10 |
| Montreal | 1.25 | 1.25 | 1.25 |
| New Orleans, per cu.yd., 2,700 lb | 3.75 | 3.75 | 2.75 |
| New York, per cu.yd | 3.40 | 3.40 | 2.15 |
| Philadelphia | 2.30@3.15 | 2.30@3.15 | 1.50@2.31 |
| Pittsburgh | 1.45@2.40 | 1.45@2.40 | 1.65@2.60 |
| St. Louis | 1.55 | 1.55 | 1.65 |
| San Francisco | 1.75 | 1.75 | 1.75 |
| Seattle, per cu.yd., 3,200 lb | 1.75 | 1.75 | 1.75 |

Note: New York gravel weighs 2,800@3,000 lb. and sand, 2,700 lb. per cu.yd.

**CRUSHED STONE**—Per ton, delivered by dealers. Weight per cu.yd., 1¼ tons, unless otherwise specified in pounds:

| | 1½ In. | ¾ In. |
|---|---|---|
| Atlanta | $2.60 | $2.60 |
| Baltimore, per cu.yd | 2.75 | 2.85 |
| Birmingham, limestone, per cu.yd | 3.00 | 3.25 |
| Boston | 2.00 | 2.00 |
| Chicago, limestone, per cu.yd., 2,500 lb | 2.00 | 2.00 |
| Cincinnati | 2.25 | 2.25 |
| Cleveland | 2.60 | 2.60 |
| Dallas, per cu.yd., 2,500 lb | 3.25 | *3.40* |
| Denver, granite, per cu.yd., 2,700 lb | 2.50 | 2.50 |
| Detroit, limestone | 2.25 | 2.25 |
| Kansas City | 2.00 | 2.00 |
| Los Angeles | 1.50 | 1.50 |
| Minneapolis, limestone, per cu.yd., 2,600 lb | 2.40 | 2.40 |
| Montreal | 1.90 | 2.10 |
| New York, limestone, per cu.yd | 3.40 | 3.40 |
| Philadelphia, limestone | 2.30@3.15 | 2.30@3.15 |
| Pittsburgh | 2.75 | 2.75 |
| St. Louis | 1.75 | 1.75 |
| San Francisco, trap rock | 1.65 | 1.65 |
| Seattle, per cu.yd., 2,700 lb | 1.90 | 1.90 |

**CRUSHED SLAG**—Manufacturers' quotation on crushed slag in carloads, per net ton, at plant:

| | 1½-In. | ¾-In. | Roofing | Sand |
|---|---|---|---|---|
| Birmingham, Ala | $0.90 | $1.15 | $2.05 | $0.55 |
| Buffalo District | 1.25 | 1.35 | 2.25 | 1.25 |
| Cleveland, Ohio | 1.10 | 1.10 | .... | 1.30 |
| Western Pennsylvania | 1.25 | 1.25 | 2.00 | 1.25 |
| Toledo, Ohio | 1.25 | 1.25 | 1.50 | 1.25 |
| Youngstown District | 1.25 | 1.35 | 2.00 | 1.25 |

**HOLLOW TILE**—Building tile per block, delivered by dealers to contractor in lots of 2,000 pieces or over:

| | 4x12x12 | 6x12x12 | 8x12x12 | 10x12x12 | 12x12x12 |
|---|---|---|---|---|---|
| Atlanta | $0.069 | $0.091 | $0.125 | $0.137 | $0.178 |
| Baltimore | .105 | ....... | .20 | ........ | .26 |
| Birmingham | .09 | .127 | .174 | .218 | .261 |
| Boston | .08 | .113 | .155 | .21 | .258 |
| Chicago | *.064* | *.088* | *.12* | *.1548* | *.172* |
| Cincinnati | .06815 | .09485 | .129 | .165 | .184 |
| Cleveland | .064 | .088 | .128 | .171 | .19 |
| Dallas | .094 | *.11* | **.18** | ........ | ........ |
| Denver | .0975 | .135 | .175 | .2125 | .25 |
| Detroit | .098 | .135 | .184 | .24 | .265 |
| Kansas City | .0525 | .077 | .184 | .24 | .265 |
| Los Angeles | .085 | .122 | .175 | .232 | .285 |
| Minneapolis | .0611 | .081 | .10605 | .1302 | .1737 |
| Montreal | .12* | ....... | .22† | ........ | ........ |
| New Orleans | .086 | .118 | .16 | .212 | .256 |
| New York | .0864 | .1296 | .162 | ........ | ........ |
| Perth Amboy, N. J.(f.o.b.) | ..... | ....... | ....... | .2388 | .2956 |
| Philadelphia | .105 | .14 | .215 | .28 | .34 |
| Pittsburgh | .068 | ....... | .1175 | ........ | .1726 |
| St. Louis | .078 | .104 | .145 | .175 | .21 |
| San Francisco | .108 | .156 | .255 | ........ | ........ |
| Seattle | .085 | .115 | .18 | ........ | ........ |

*4x4x12. †8x8x12.

**BRICK**—Prices delivered by dealers per thousand, are as follows:

| | | Paving F.O.B. | |
|---|---|---|---|
| | Common | 3x8¼x4-In. | 3½x8¼x4-In. |
| Atlanta | $12.00 | $36.00* | $42.00† |
| Baltimore | 13.00 | 40.00 | 46.00 |
| Birmingham | *13.50* | 26.00* | 31.00† |
| Boston | 16.00 | 43.00 | 47.00 |
| Chicago | 12.00 | 42.00 | 45.00 |
| Cincinnati | 17.50 | 37.00 | 39.00 |
| Cleveland | 14@16 | 33.00 | 36.00 |
| Dallas | 14.50 | 29.00* | ..... |
| Denver | 11.00 | ..... | ..... |
| Detroit | 15.50 | 33.50 | 36.50 |
| Kansas City | 14.00 | ..... | ..... |
| Los Angeles | 10.00 | ..... | ..... |
| Minneapolis | 12.75 | ..... | ..... |
| Montreal | 20.00 | ..... | ..... |
| New Orleans | 16.50 | 38.00* | 45.00 |
| New York | 13.00 | 45.00 | 50.00 |
| Philadelphia | 16.00 | 40.00 | 46.00 |
| Pittsburgh | 16.00 | 40.50 | 45.00 |
| St. Louis | 13.00 | 40.00 | 40.00 |
| San Francisco | 14.50 | 45.00* | ..... |
| Seattle | 14.00 | 50.00 | 55.00 |

*2½x8¾x4 in. †3x8¼x4.

**LIME**—Prices delivered by dealers to job:

| | Hydrated, per Ton | | Lump, per Barrel | |
|---|---|---|---|---|
| | Finishing | Common | Finishing | Common |
| Atlanta | $21.00 | $13.50 | ...... | ...... |
| Baltimore | 22.00 | 14.00 | $2.55† | ...... |
| Birmingham | 22.00 | 16.00 | 3.00† | $2.00† |
| Boston | 22.00 | 15.00 | 4.00* | 3.15* |
| Chicago | 17.00 | 14.50 | 15.00‡ | 15.00‡ |
| Cincinnati | 15.80 | 13.00 | ...... | ...... |
| Cleveland | ...... | ...... | ...... | ...... |
| Dallas | 20.00 | ...... | ...... | 18.00‡ |
| Denver | 32.00 | 23.75 | 3.80* | 3.00* |
| Detroit | 18.00 | 14.80 | 2.20† | 2.00† |
| Kansas City | 22.00 | *17.00* | 2.85† | *2.25*† |
| Los Angeles | 18.90 | 16.00 | 2.85† | 14.00‡ |
| Minneapolis | 25.50 | 21.00 | ...... | 1.70† |
| Montreal | 19.75 | ...... | ...... | 15.00‡ |
| New Orleans | ...... | ...... | 2.60† | 1.60† |
| New York | 21.00 | 13.00 | 4.10* | 3.15* |
| Philadelphia | 22.00 | 15.00 | ...... | ...... |
| Pittsburgh | 20.00 | 17.00 | 2.50† | ...... |
| St. Louis | 24.00 | 18.00 | 2.75† | 15.00‡ |
| San Francisco | 20.00 | 20.00 | ...... | 1.85† |
| Seattle, paper sacks | 35.00 | 24.00 | ...... | 2.80† |

*Per 280-lb. bbl. (net). †Per 180-lb. (net). ‡Per ton.

**CONCRETE BLOCKS**—Manufacturers' quotations on standard, 8x8x16-in., hollow, delivered to job, each:

| | | | |
|---|---|---|---|
| Boston | $0.18@$0.20 | Minneapolis | $0.11 |
| Brooklyn and Queens | .12@ .14 | New Orleans | .22 |
| Cleveland | .16@ .17 | Philadelphia | .18@.25 |
| Denver | .22 | Pittsburgh | .20 |
| Detroit | .15 | St. Louis | .17 |
| Kansas City | **.18** | | |

**SLATE**—Roofing, f.o.b., quarry, Bangor, Pa., net, per square:

| | |
|---|---|
| No. 1 Clear | $9.00@$14.00 |
| No. 1 Ribbon | 7.50@ 10.25 |
| Medium Clear | 8.00@ 10.50 |

## Road and Paving Materials

**PAVING STONE**—Carloads or cargo lots of granite blocks, 4x8x4-in., dressed, f.o.b.:

| | |
|---|---|
| Atlanta | $3.00 per sq.yd. |
| Baltimore | 3.00 per sq.yd. |
| Boston | 135.00 per M. |
| Chicago, 5 in | 3.25@3.90 per sq.yd. |
| Cincinnati | 110.00 per M. |
| Cleveland | 115@120 per M. |
| Detroit, 5 in | 3.00 per sq.yd. |
| Kansas City | 3.00 per sq.yd. |
| Minneapolis, 4½x8x5 in | 2.80 per sq.yd. |
| Montreal | 104.75 per M. |
| New Orleans | 2.80 per sq.yd. |
| New York, 5 in., Grade 1, 30 blocks per sq.yd | 150.00 per M. |
| Philadelphia | 125.00 per M. |
| St. Louis, 4x5x8 to 12 in | 3.50 per sq.yd. |

# Current Prices of Construction Materials

## Road and Paving Materials—Continued

**WOOD-BLOCK PAVING**—Prices, f.o.b., in carloads:

| | Size of Block | Treatment | Per Sq.Yd. |
|---|---|---|---|
| Atlanta | 3½ | 16 | $2.25 |
| Boston | 3½ | 16 | 2.25 |
| Chicago | 3½ | 12 | 2.10 |
| Cincinnati | 3½ | 16 | 2.35 |
| Kansas City | 3½ | 16 | 2.75 |
| Minneapolis | 3½ | 16 | 2.75 |
| Montreal | 4 | 16 | 4.50 |
| New Orleans | 3½ | 16 | 2.40 |
| New York | 3½ | 16 | 2.50 |
| St. Louis | 3½ | 16 | 2.40 |

**FLAGGING**—Alongside dock, New York: Manhattan and Bronx, 4 ft. wide, 24c. per sq.ft.; Queens, 5 ft. wide, 26c. per sq.ft.

**CURBING**—*New York*: Bluestone, f.o.b. barge, 5x16 in., rough, 90c. per lin.ft., cutting charges extra. *Birmingham*: Limestone, 5x18-in., f.o.b., $1.05 per lin.ft. *St. Louis*: Class "B" straight, 5x16-in., f.o.b., $1.00 per lin.ft.; roundings, $1.35 per lin.ft.

**ASPHALT**—Manufacturers' quotations per ton in packages (350-lb. bbls or 425-lb. drums); also in tank-car lots, f.o.b. points listed:

| | Package | Tank-car |
|---|---|---|
| Atlanta (Mexican) | *$19.40* | *$15.40* |
| Baltimore (Standard Oil, f.o.b. refinery) | 21.75 | 17.75 |
| Birmingham (Mexican) | 27.00 | 23.00 |
| Boston (Mexican) | 23.50 | 18.00 |
| Chicago (Texas) | 23.50 | 19.30 |
| Cincinnati (Kentucky Rock) | ...... | 12.30 |
| Cleveland | 24.00 | 20.00 |
| Dallas (Texas) | 24.40 | ...... |
| Denver (California) | 35.00 | ...... |
| Detroit (Mexican) (Texas) | 19.72 | 14.87 |
| Kansas City, Mo. (Texas) | *21.30* | *17.00* |
| Los Angeles ("D" Grade, Calif., f.o.b., El Segundo) | 18.00 | 12.00 |
| Maurer, N. J. (Bermudez) | 30.00 | ...... |
| Maurer, N. J. (Trinidad) | 25.00 | ...... |
| Minneapolis, (Stanolind, f.o.b., Twin Cities) | 23.00 | 19.10 |
| Montreal (Imperial) | 28.00 | 21.50 |
| New Orleans (Texas) | 24.00 | 21.00 |
| New York (Texas) | 22.50 | 18.50 |
| Philadelphia (Mexican) | 18.00 | 15.00 |
| Pittsburgh (Standard Oil) | 24@26 | 14@18 |
| St. Louis (Venezuelan) | 17.00 | 13.00 |
| San Francisco, (f.o.b. refinery, Oleum, Calif.) | 18.00 | 12.00 |
| Seattle (Standard Oil) | 21.40 | 18.00 |

**ROAD OILS**—Manufacturers' quotations, f.o.b., in tank cars, 8,000 gal. minimum, per gal.:

| | |
|---|---|
| Birmingham, 40@50% asphalt | $0.0525 |
| Birmingham, 50@60% asphalt | .0525 |
| Dallas, 40@50% asphalt | *.0525* |
| Dallas, 50@60% asphalt | *.0525* |
| New York, 40@50% asphalt, (at terminal) | .05 |
| New York, 50@60% asphalt, (at terminal) | .05 |
| St. Louis, 40@50% asphalt | .04 |
| St. Louis, 50@60% asphalt | .04 |

## Iron and Steel

**PIG IRON**—Producers' quotations, per gross ton, f.o.b.:

| | |
|---|---|
| Birmingham, No. 2 fdry., silicon 1.75@2.25 | $14.00 |
| Pittsburgh, basic, incl. freight ($1.76) from Valley | 19.63@20.13 |

**STRUCTURAL STEEL**—Manufacturers' and dealers' quotations per 100 lb.

| | Shapes, 3 to 15-In | Plates, ¼-In. |
|---|---|---|
| Birmingham, large mill lots, f.o.b | $2.15 | $2.15 |
| Chicago, warehouse, delivered | 3.00 | 3.00 |
| Cleveland, warehouse, delivered | 3.00 | 3.00 |
| Dallas, warehouse, delivered | 3.75 | 3.75 |
| New York, warehouse, delivered, up to 3,999 lb. | 3.10 | 3.10 |
| Pittsburgh, large mill lots, f.o.b | *1.60* | *1.60* |
| St. Louis, warehouse, delivered | 3.25 | 3.25 |
| San Francisco, warehouse, delivered | 3.40 | 3.40 |

**BARS, CONCRETE REINFORCING**—Manufacturers' and dealers' quotations on bars rolled from billets, per 100 lb. for ¾-in.:

| | |
|---|---|
| Birmingham, large mill lots, f.o.b | $2.15 |
| Chicago warehouse, delivered | 2.15@3.00 |
| Cleveland, warehouse, delivered | 2.25@2.44 |
| Dallas, warehouse, delivered | 2.85 |
| New York, warehouse, delivered, over 5 tons | 2.70 |
| Pittsburgh, large mill lots, stock lengths, f.o.b | **1.70** |
| St. Louis, warehouse, delivered | 3.15 |
| San Francisco, warehouse, delivered | 2.50 |

**EXPANDED METAL LATH**—Per 100 sq.yd., painted, delivered to job, in less-than-carload lots:

| Lb. per Sq.Yd. | New York | Birmingham | Chicago | St. Louis | Dallas | San-Francisco |
|---|---|---|---|---|---|---|
| 2.2 | $18.50 | $22.00 | *$10.10* | $18.00 | $21.50 | $21.50 |
| 2.5 | 19.50 | 23.00 | *10.90* | 19.00 | 24.00 | 22.50 |
| 3.0 | 21.00 | 25.00 | *12.25* | 20.50 | 25.50 | 25.00 |
| 3.4 | 22.00 | 26.50 | *13.10* | 21.50 | 30.00 | 27.00 |

**WIRE REINFORCEMENT FOR CONCRETE**—Manufacturers' quotations per 100 sq.ft. in carloads at mills; dealers, delivered', in lots of 10,000 sq.ft. or over; plain 4 in. by 4 in. mesh:

| | | | | Warehouse Delivery | | | |
|---|---|---|---|---|---|---|---|
| Style Number | Weight in Pounds per 100 sq.ft. | Pittsburgh Mill | Chicago District Mill | New York | St. Louis | Dallas | San Francisco |
| 032 | 22 | $0.99 | $1.01 | $1.39 | $1.30 | $1.13 | $1.22 |
| 049 | 28 | 1.26 | 1.29 | 1.76 | 1.70 | 1.38 | 1.55 |
| 068 | 35 | 1.54 | 1.58 | 2.18 | 2.10 | 1.67 | 1.91 |
| 093 | 40 | 1.98 | 2.03 | 2.79 | 2.65 | 2.00 | 2.46 |
| 126 | 57 | 2.45 | 2.51 | 3.45 | 3.30 | 2.55 | 3.03 |
| 153 | 68 | 2.92 | 2.99 | 4.13 | 4.00 | 3.16 | .... |
| 180 | 78 | 3.35 | 3.43 | 4.73 | 4.60 | 3.47 | .... |

**STEEL SHEETS**—Manufacturers' and dealers' quotations per 100 lb. base:

| | Blue Annealed No. 10* | Black No. 24 | Galvanized No. 24 |
|---|---|---|---|
| Chicago, warehouse, delivered | $3.35† | $4.05† | $4.60† |
| Cleveland, warehouse, delivered | 3.00 | 3.60 | 4.35 |
| New York, warehouse, delivered | 3.40 | 3.90 | 4.25 |
| Pittsburgh, large mill lots, f.o.b | *1.90*@2.00 | *2.45*@2.55 | *3.10* |
| St. Louis, warehouse, delivered | 3.45 | 4.25 | 4.85 |
| San Francisco, warehouse, delivered | 3.80 | 4.35 | 5.00 |

*Light plates. †400 lb. to 3,999 lb.

**WIRE ROPE**—Discounts from manufacturers' list price on regular grades of bright and galvanized, Eastern Territory, New York, and East of Missouri River.

| | Base |
|---|---|
| Cast steel round strand rope | 20% |
| Galvanized iron rigging and guy rope (add to list) | 12½% |
| Galvanized steel rigging and guy rope | 7½% |
| Plow steel round strand rope | 35% |
| Round strand iron and iron tiller | 5% |
| "Special Steel" and extra strong cast steel, round strand rope | 27½% |

Discount 5 points less than discount for Eastern territory: California, Oregon, Nevada, Washington, Wyoming, New Mexico, Colorado, North Dakota, Nebraska, Kansas, Oklahoma and Texas. Discount 10 points less than discount for Eastern territory: Arizona, Montana, Idaho and Utah.

**RIVETS**—Manufacturers' and dealers' quotations on structural rivets, rounds head, ¾-in., full kegs, per 100 lb.:

| | |
|---|---|
| Chicago, warehouse, delivered | $4.00 |
| Dallas, warehouse, delivered | **5.00** |
| Denver | 4.80 |
| New York, warehouse, delivered | 4.50* |
| Pittsburgh, large mill lots, f.o.b | 2.90 |
| St. Louis, warehouse, delivered | 4.15 |
| San Francisco, warehouse, delivered | 5.50 |
| Seattle, warehouse, delivered | 4.25 |

*This price is for full kegs; broken kegs are $6.00 per 100 lb.

**STEEL SHEETPILING**—The manufacturers' base price, f.o.b., Pittsburgh, for large mill lots is $2.25 per 100 lb.

**TERNE PLATE**—I C, 8-lb. coating, 20x28-in., f.o.b., Pittsburgh mill:

| | |
|---|---|
| Per package | $10.30 |

**SHIP SPIKES**—Per 100 lb., black, from dealers' warehouse stocks; galvanized are about $1.75 per 100 lb. higher:

| | ¼-In. | ⅜-In. | ½-In. |
|---|---|---|---|
| San Francisco | $5.55 | $5.10 | $4.95 |
| Seattle | 7.75 | 5.65 | 5.50 |

Pittsburgh mill base in lots of 200 kegs or more, $3.00 per 100 lb.

**WIRE NAILS**—Per 100 lb. keg, base, delivered from warehouse stocks; also Pittsburgh mill base:

| Pittsburgh Mill | Birmingham | Chicago | St. Louis | Dallas | San Francisco | Montreal |
|---|---|---|---|---|---|---|
| *$2.05* | $3.30 | $3.30 | $2.75 | **$3.85** | $3.25 | $4.95 |

**SCRAP**—The prices following are, f.o.b., per ton, paid by dealers:

| | New York Per Gross Ton | Chicago Per Gross Ton | Detroit Per Gross Ton |
|---|---|---|---|
| No. 1 railroad wrought | *$9.75* | $11.25@$11.75 | ...... |
| Stove plate | 6.00 | *9.00@ 9.50* | $7.00 |
| No. 1 machinery cast | 9.50 | 12.50@ 13.00 | *9.75** |
| Machine shop turnings | 5.00 | 6.00@ 6.50 | 6.00 |
| Cast borings | *4.50* | 8.00@ 8.50 | 7.00 |
| Railroad malleable | 10.50 | 13.50@ 14.00 | 12.00 |
| Re-rolling rails | 9.50 | 14.50@ 15.00 | *12.00* |
| Re-laying rails, 56@60 lb. | 23.00 | 23.00@ 25.00 | ..... |
| Heavy melting steel, No. 1 | 9.00 | 12.00@ 12.50 | 11.00 |
| Iron and steel pipe | *7.25* | 7.00@ 7.50 | ..... |

*Net ton.

**FREIGHT RATES**—Effective May 20, 1930, on finished steel products in the Pittsburgh district, including plates, structural shapes, merchant-steel bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished) chains, etc., the following freight rates in cents per 100 lb., apply on carload lots of 36,000 lb. or 18 tons:

| | | | |
|---|---|---|---|
| Atlanta | $0.58 | Detroit | $0.265 |
| Baltimore | .27 | Kansas City | .71† |
| Birmingham | .58 | New Orleans | .67 |
| Boston | .40 | New York | .33 |
| Buffalo | .235 | Pacific Coast (all rail) | 1.15* |
| Chicago | .34 | Philadelphia | .29 |
| Cincinnati | .265 | St. Louis | .39 |
| Cleveland | .185 | St. Paul | .60 |
| Denver | 1.15* | | |

*Minimum weight on structurals, 60,000 lb. †Except iron or steel pipe and fittings.

## Railway Materials and Supplies

**STEEL RAILS**—Manufacturers' quotations per gross ton, f.o.b., for large mill lots:

| | Pittsburgh | Birmingham | Chicago |
|---|---|---|---|
| Standard openhearth rails | $43.00 | $43.00 | $43.00 |
| Light rails, 25 to 45 lb | *34.00* | 34@36 | 34@36 |
| Re-rolled rails | *32.00* | 34@36 | 34@36 |

**RAILWAY TIES**—For fair-sized orders, f.o.b., the following prices per tie hold:

| | | 6 In. x 8 In. by 8 Ft. | 7 In. x 9 In. by 8½ Ft. |
|---|---|---|---|
| New York | Long-leaf sap pine, untreated | $1.05 | $1.20 |
| | Creosoted—prices on application. | | |
| Birmingham | White oak, creosoted | 1.52 | 1.75 |
| | Southern pine, creosoted | 1.25 | 1.60 |
| Chicago | White oak, untreated | *1.35* | *1.70* |
| | Oak, empty cell, creosoted | *1.75* | *2.30* |
| | Oak, zinc treated | *1.55* | *2.05* |
| | Southern pine, creosoted | *1.45* | *1.90* |
| St. Louis | White oak, untreated | 1.08 | 1.60 |
| | Red oak, creosoted | 1.35 | 2.00 |
| | Sap pine or cypress, untreated | .80 | 1.15 |
| San Francisco | Douglas fir, green, untreated | .70 | *1.00* |
| | Douglas fir, empty cell, creosoted | 1.47 | 2.38 |
| Montreal | Birch or maple, untreated | .75@1.25 | .75@1.25 |
| | Birch or maple, creosoted | 1.20@1.30 | 1.50@1.60 |

# *Current Prices of Construction Materials*

## Railway Supplies—Continued

**TRACK SUPPLIES**—Manufacturers' and dealers' quotations per 100 lb. f.o.b., Pittsburgh mill, for large mill lots, together with warehouse prices at other places named:

| | Pittsburgh | Chicago | Birmingham | St. Louis | San Francisco |
|---|---|---|---|---|---|
| Standard spikes, 9⁄16-in. and larger | $2.80 | $3.55 | $3.45 | $3.65@$3.75 | $4.10 |
| Track bolts | 3.80 | 4.55 | 5.85 | 4.65@ 4.75 | 5.10 |
| Standard section angle bars, splice bars or fish plates | 2.75 | 3.40 | 3.75 | ............ | ..... |

Tie plates: Price at Pittsburgh mill, $2.07½ per 100 lb.

## Pipe

**WROUGHT-STEEL PIPE**—Discounts from manufacturers' and dealers' standard lists:

| | 1 to 3-In. Butt Weld | | 3½ to 6-In. Lap Weld | |
|---|---|---|---|---|
| | Black | Galvanized | Black | Galvanized |
| Chicago, warehouse, delivered | 57.3% | 44.8% | 53.9% | 41.4% |
| Cleveland, warehouse, delivered | 53.3% | 42.3% | 50.8% | 37.8% |
| New York, warehouse, delivered | 56.14% | 43.6% | 52.72% | 40.18% |
| Pittsburgh, large mill lots, f.o.b. | 64% | 52.5% | 61% | 49.5% |
| St. Louis, warehouse, delivered | 51% | 38% | 48% | 35% |

**CAST-IRON PIPE**—Prices of U. S. Pipe & Foundry Co., per net ton, for bell and spigot pipe, Class B and heavier, f.o.b., on regular lots of pipe:

| | 4-In. | 6-In. and Over |
|---|---|---|
| Atlanta | ............ | $43.00 |
| Birmingham mill | $40.00@$41.00 | 37.00@$38.00 |
| Burlington (N. J.) mill | 40.00 | 37.00 |
| Chicago | 48.20@ 49.20 | 45.20@ 46.20 |
| Dallas | ............ | *50.50* |
| New York | 42.90 | 39.90 |
| Pittsburgh | 48.80@ 49.80 | 45.80@ 46.80 |
| St. Louis | 48.00 | 45.00 |
| San Francisco | 50.00@ 51.00 | 47.00@ 48.00 |

Gas pipe and Class A, $3.00 per ton extra.

**SEWER PIPE**—Prices delivered, per foot, for standard pipe; 6, 8 and 12-in. are single strength and 18, 24, 30 and 36-in. are double strength:

| | 6-In. | 8-In. | 12-In. | 18-In. | 24-In. | 30-In. | 36-In. |
|---|---|---|---|---|---|---|---|
| Atlanta | $0.16 | $0.26 | $0.45 | ..... | ..... | ..... | ..... |
| Baltimore | .10 | .30 | .58 | ..... | $1.93 | ..... | $6.50 |
| Birmingham | .25 | .40 | .65 | $1.50 | 2.75 | $3.90 | 5.85 |
| Boston | *.18* | .30 | *.55* | 1.35 | 2.25 | 3.70 | 6.50 |
| Chicago | .18 | .28 | .54 | 1.25 | 2.25 | 4.75 | 6.00 |
| Cincinnati | .135 | .21 | .405 | 1.05 | 1.89 | 3.456 | 5.4325 |
| Cleveland | .189 | .294 | .567 | 1.35 | 2.43 | 4.824 | 7.38 |
| Dallas | .25 | .375 | .68 | 1.60 | 2.85 | ..... | ..... |
| Denver | .161 | .23 | .414 | .816 | 1.44 | ..... | ..... |
| Detroit | .18 | .28 | .6075 | 1.50 | 2.70 | 5.12 | 7.91 |
| Kansas City | .21 | .29 | .51 | ..... | 1.90 | 3.80 | ..... |
| Los Angeles | .21 | .29 | .52 | 1.186 | 2.03 | 3.39 | 5.09 |
| Minneapolis | .16 | .25 | .50 | 1.15 | 1.85 | 3.49 | 4.97 |
| Montreal | .36 | .53 | .78 | 1.48 | 2.75 | 4.20 | ..... |
| New Orleans | .195 | .325 | .585 | 1.10 | 2.11 | ..... | ..... |
| New York | .17 | .265 | .52 | 1.30 | 2.34 | 4.47 | 6.86 |
| Philadelphia | .117 | .182 | .351 | 1.05 | 1.89 | 3.60 | 5.6375 |
| Pittsburgh | .0945 | .147 | .2835 | .85 | 1.53 | 3.024 | 4.8175 |
| St. Louis | .1645 | .26 | .468 | 1.092 | 1.872 | 3.65 | 4.80 |
| San Francisco | .1925 | .275 | .495 | 1.155 | 1.98 | 3.30 | 4.95 |
| Seattle | .22 | .30 | .54 | 1.26 | 2.16 | 3.50 | ..... |

**CLAY DRAIN TILE**—Prices delivered by dealers, per 1,000 lin.ft.:

| Size, In. | New York | Birm'ham | St. Louis | Dallas | San Fran. | Seattle |
|---|---|---|---|---|---|---|
| 4 | $55.00 | $56.00 | $50.00 | $63.00 | $67.50 | $60.00 |
| 6 | 112.00 | 112.00 | 85.00 | 100.00 | 112.50 | 112.00 |

## Miscellaneous

**LINSEED OIL**—Raw oil, f.o.b., in 1- to 4-bbl. lots, per lb.:
New York.... *$0.132* Chicago.... *$0.131* Minneapolis...*$0.136*

**WHITE AND RED LEAD**—Base price per 100-lb. keg, f.o.b., New York: White, dry, $13.75; White, in oil, $13.75; Red, dry, $13.75; Red, in oil, $15.25.

**CHEMICALS**—Water, sewage treatment, road work, round lots in the New York market:

| | |
|---|---|
| Sulphate of aluminum, in bags, per 100 lb | $1.40@$1.45 |
| Sulphate of copper, in bbl., per 100 lb | 4.75@ 5.00 |
| Soda ash, 58%, in bags, per 100 lb | 1.32@ 1.35 |
| Chlorine, cylinders, per lb | *.0¼*@ .06 |
| Bleaching powder, in drums, f.o.b. works, per 100 lb | 2.00@ 2.10 |
| Calcium chloride, flaked, in drums, f.o.b. works, per ton | 22.75 |

**MANILA ROPE**—The number of feet per pound for the various sizes is as follows: ½-in., 7-ft., 6-in.; ¾-in., 6-ft., 1-in.; ⅞-in., 4-ft., 5-in.; 1-in., 3-ft., 8-in.; 1¼-in., 2-ft., 5-in.; 1½-in., 1-ft., 8-in. Following prices are quoted by dealers per pound for ¾-in. and larger:

| | | | |
|---|---|---|---|
| Atlanta | $0.25 | Kansas City | $0.29 |
| Baltimore | .225 | Los Angeles | .25 |
| Birmingham | .26 | Minneapolis | .21 |
| Boston | .215 | Montreal | .185 |
| Chicago | .19 | New Orleans | .25 |
| Cincinnati | .21 | New York | .205 |
| Cleveland | .21 | Philadelphia | .23 |
| Dallas | *.21* | San Francisco | .195 |
| Denver | .22 | Seattle | .195 |
| Detroit | .23 | St. Louis | .205 |

**BUILDING PAPER**—Black, 50-lb., in carloads, per roll of 500 sq.ft., f.o.b., producing point ........ $2.20

**SLATERS FELT**—In carloads, per roll, f.o.b., producing point ........ $0.85

**ROOFING MATERIALS**—Price f.o.b., New York, delivered by dealers to contractors in carloads:

| | |
|---|---|
| Asphalt felt, per 100 lb | $3.00 |
| Tar felt, per 100 lb | 3.00 |
| Asphalt coating, per gal | .34½ |
| Tar pitch, in 350 lb. barrels, per ton | 28.00 |

**PREPARED ROOFINGS**—Prices delivered by dealers to contractors, in each load, f.o.b. New York, per square:

| | |
|---|---|
| Single shingles, slate finish, sufficient to cover 100 sq.ft. | $6.12 |
| Strip shingles, 4 in 1, hexagonal shape, with Underwriters' label | 6.00 |
| Slate surfaced roofing in rolls weighing 85 to 90 lbs. | 2.50 |

**WINDOW GLASS**—United inches 25, bracket size 6x8 to 10x15, single or double thickness, discount from jobbers' list (Sept. 15, 1928), at New York warehouses:
AA........... 83% A........... 86% B........... 88%

**EXPLOSIVES**—Manufacturers' quotations per pound for dynamite delivered in small lots, under 200 lb.:

| | Gelatin | | | Gelatin | |
|---|---|---|---|---|---|
| | 40% | 60% | | 40% | 60% |
| Atlanta | $0.22 | $0.245 | Los Angeles, f.o.b.† | $0.1875 | $0.2225 |
| Baltimore | .215 | .2375 | Minneapolis | .2225 | .2450 |
| Birmingham | .22 | .245 | Montreal | .20 | .24 |
| Boston | .225 | .255 | New Orleans | .195 | .22 |
| Chicago | .195* | .22* | New York | .255‡ | .2775‡ |
| Cincinnati | .22 | .245 | Philadelphia | .215 | .24 |
| Dallas | .20 | *.275* | St. Louis | .215 | .235 |
| Denver, f.o.b. | .19 | .2125 | San Francisco | .155 | .18 |
| Kansas City, Mo. | .2025 | .2225 | Seattle | .1525 | .175 |

*Quantities above 500 lb. but less than a ton. †San Fernando Arsenal. ‡Special gelatin in case lots.

## Lumber

### Prices Are Per Thousand Feet, Board Measure

**New York**—Timbers, No. 1 Common, rough, delivered in Manhattan to contractor at site of job, in 20 ft. lengths and under, per M. ft., b.m.:

| | Long-leaf Yellow Pine | Douglas Fir |
|---|---|---|
| 3x4 to 8x8 | $50.00 | $37.00 |
| 3x10 to 10x10 | 60.00 | 38.00 |
| 3x12 to 12x12 | 70.00 | 39.00 |
| 3x14 to 14x14 | 80.00 | 47.50 |

**Chicago**—Prices, f.o.b., in carloads, No. 1 Common, rough, per M. ft. b.m. For delivery to job from stock, in truckloads, add $10 per M. ft., b.m.:

| | 20 Ft. and Under Long-Leaf Yellow Pine | Up to 32 Ft. Douglas Fir |
|---|---|---|
| 3x4 to 8x8 | $43.00 | $39.50 |
| 3x10 to 10x10 | 50.50 | 39.50 |
| 3x12 to 12x12 | 62.50 | 39.50 |
| 3x14 to 14x14 | 74.50 | 40.50 |

**San Francisco**—Douglas fir, No. 1 common, rough, at yards. For delivery to contractor at site of job, add $1.50 to $5 per M. ft., b.m.:

| | 10-16-18 and 20 Ft. | 22 and 24 Ft. |
|---|---|---|
| 3x3 and 4 | $30.00 | $32.00 |
| 3x6 and 8 | 30.00 | 32.00 |
| 3x10 and 12 | 30.00 | 32.00 |
| 3x14 | 33.00 | 34.00 |

**Other Cities**—Delivered by dealers, No. 1 Common, rough, per M. ft., b.m.:

| | 8x8-In. x 20 Ft. and Under | | | | 3x12 to 12x12-In. 20 Ft. and Under | |
|---|---|---|---|---|---|---|
| | Pine | Fir | Hemlock | Spruce | Pine | Fir |
| Atlanta | $55.00 | ...... | ...... | ...... | $65.00 | ...... |
| Baltimore | 36.00 | $50.00 | $53.50 | $61.00 | 75.00 | $50.25 |
| Birmingham | 53.00 | ...... | ...... | ...... | 56.50 | ...... |
| Boston | 52.50 | 45.00 | 47.00 | 48.00 | 60.00 | 40.00 |
| Cincinnati | 47.50 | 58.50 | ...... | ...... | 65.00 | 52.50 |
| Cleveland | 58.00 | 58.00 | ...... | ...... | 58.00 | 58.00 |
| Dallas | 55.00 | 55.00 | 52.50 | 55.00 | 55.00 | 52.50 |
| Denver | ...... | 50.00 | 47.50 | 47.50 | ...... | 55.00 |
| Detroit | *53.00* | *51.00* | ...... | ...... | *67.00* | *51.00* |
| Kansas City | **38.50** | **46.50** | ...... | ...... | 52.50 | *54.50* |
| Los Angeles | ...... | *41.50* | ...... | ...... | ...... | *41.50* |
| Minneapolis | *54.00* | *46.25* | ..... | ...... | *54@56* | *46.25@47.75* |
| Montreal | 50.00 | 48.00 | ...... | ...... | 56.00 | 48.00 |
| New Orleans | 52.00 | 48.00 | ...... | 44.00 | 67.00 | 65.00 |
| Philadelphia | 50.00 | 43.00 | 42.00 | 48.00 | 60.00 | 43.00 |
| Pittsburgh | 65.00 | 70.00 | 75.00 | 65.00 | 65.00 | 65@72 |
| St. Louis | 51.00 | 46.00 | 44.00 | ...... | 62.00 | 46.00 |
| Seattle | ...... | 18.00 | ...... | ...... | ...... | 19@20 |

| | 1x10 In. x 16 Ft. and Under | | | 2x10 In. x 16 Ft. T. & Gr. | |
|---|---|---|---|---|---|
| | Pine | Fir | Hemlock | Pine | Fir |
| Atlanta | $60.00 | ...... | ...... | $42.50 | ...... |
| Baltimore | 55.00 | $44.50 | $44.00 | ...... | ...... |
| Birmingham | 36.00 | ...... | ...... | 45.00 | ...... |
| Boston | 46.50 | 40.00 | 42.00 | 48.50 | $45.00 |
| Cincinnati | 61.00 | 52.50 | ...... | 38.00 | 50.00 |
| Cleveland | 60.00 | 48.00 | ...... | 45.00 | 58.00 |
| Dallas | 60.00 | ...... | ...... | 55.00 | ...... |
| Denver | ...... | 38.00 | 38.50 | ...... | 44.00 |
| Detroit | *48.00* | *44.00* | ...... | 48.50 | *46.50* |
| Kansas City | *48.50* | *35.50* | ...... | **38.50** | **37.75** |
| Los Angeles | ...... | *38.50* | ...... | ...... | *53.50* |
| Minneapolis | *49.00* | *40.00* | ...... | *47.00* | *39.00* |
| Montreal | 56.00 | ...... | ...... | ...... | ...... |
| New Orleans | 49.00 | 49.00 | ...... | 59.00 | 55.00 |
| Philadelphia | 52.00 | 43.00 | 41.00 | 55.00 | 44.00 |
| Pittsburgh | 50.00 | 60.00 | 59.00 | 42.00 | ...... |
| St. Louis | 47.00 | 45.00 | 45.00 | 47.50 | 45.00 |
| Seattle | ...... | 18.00 | ...... | ...... | 19.00 |

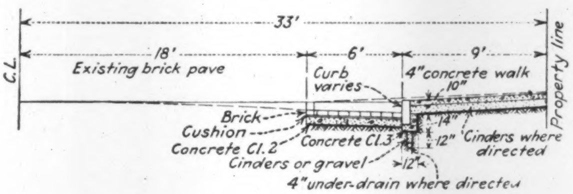
**PILES**—Prices of Nichols Bros., 90 West St., N.Y.C., per lineal foot, pine, with bark on, f.o.b., New York; delivered from barge, 1¾ to 2c. per ft. additional:

| Dimensions | Points | Length | Barge | Rail |
|---|---|---|---|---|
| 12 in. at butt | 6 in. | 30 to 50 ft. | $0.14½ | $0.18 |
| 12 in.—2 ft. from butt | 6 in. | 50 to 59 ft. | .19 | .23 |
| 12 in.—2 ft. from butt | 6 in. | 60 to 69 ft. | .21½ | .25 |
| 14 in.—2 ft. from butt | 6 in. | 50 to 69 ft. | .25½ | .36 |
| 14 in.—2 ft. from butt | 6 in. | 70 to 79 ft. | .27½ | .31 |
| 14 in.—2 ft. from butt | 5 in. | 80 to 85 ft. | .33 | .41 |
| 14 in.—2 ft. from butt | 5 in. | 85 to 89 ft. | .38 | .45 |

# Unit Prices From Current Construction Bids

## Widening Pavement in Akron

CONTRACTS were awarded early in July, 1930, on three street-improvement jobs in Akron, Ohio, involving setting back curbs and widening roadways at the expense of sidewalk space. The most important of these is on South High St., a thoroughfare east of and parallel to the main street of Akron, passing within a block of the Goodrich Rubber Co. and the Firestone Tire & Rubber Co. and passing the Miller Rubber Co. plant. The roadway is to be widened 12 ft. (to 48 ft.) for a distance of nine blocks, beginning at a downtown intersection and ending just below the business section of the city.



TYPICAL HALF-SECTION OF WIDER SOUTH HIGH ST., AKRON

The roadway, as planned, will provide for parking cars on one side and for four lanes of moving traffic. The cost, except 2 per cent and intersections, will be assessed against abutting property. Part of the improvement is a boulevard lighting system with 1,000-cp. incandescent lamps spaced 200 ft.

Unit prices on the principal items are given of the lowest two bidders: (A) T. E. McShaffrey Construction Co., $60,595; (B) P. T. McCourt Construction Co., $61,471.

| | | |
|---|---|---|
| 4,300 cu.yd. grading | $0.55 | $0.80 |
| 25 cu.yd. trench excav | 2.00 | 2.00 |
| 8,000 lin.ft. under-drainage 4 in. pipe | .10 | .10 |
| 365 lin.ft. inlet connections 12 in. pipe | 2.00 | 1.50 |
| 85 lin.ft. drains 15 in. pipe | 6.00 | 6.00 |
| 325 lin.ft. drains 18 in. pipe | 7.50 | 800 |
| 5 manholes complete | 100.00 | 100.00 |
| 5 cu.yd. concrete class 1 | 12.00 | 15.00 |
| 60 cu.yd. concrete class 2 ret walls | 14.00 | 12.00 |
| 20 cu.yd. concrete class 3 | 8.00 | 10.00 |
| 5 cu.yd. brick masonry | 20.00 | 25.00 |
| 3,790 lin.ft. sandstone curb (6x18 in.) hand dressed | 1.35 | 1.50 |
| 825 lin.ft. granite circ. curb (6x18 in.) class A | 3.00 | 3.10 |
| 825 lin.ft. granite circ. curb (6x18 in.) class B | 2.50 | 3.00 |
| 3,315 lin.ft. sandstone curb redressed | .30 | .30 |
| 3,390 lin.ft. curb reset | .60 | .70 |
| 5,600 sq.yd. concrete base 5 in. | 1.10 | 1.40 |
| 5,600 sq.yd. concrete base 6 in. | 1.25 | 1.50 |
| 5,600 sq.yd. concrete base 7 in. | 1.40 | 1.65 |
| 5,600 sq.yd. concrete base 8 in. | 1.65 | 1.80 |
| 5,600 sq.yd curing base | .02 | .03 |
| 5,600 sq.yd. repressed brick pav't (asph. fill) | 2.15 | 2.35 |
| 700 sq.yd. brick pav't relaid | 1.50 | 1.50 |
| 13,500 sq.ft. cement walk two-course | .20 | .22 |
| 1,700 sq.ft. cement driveway | .25 | .27 |
| 500 lin.ft. ½ in. bitum. expan. strip | .10 | .10 |
| 10 cu.yd. cinders | 1.00 | 1.00 |
| 36 metal light standard-U.M. 1523 | 105.00 | 103.35 |
| 17,740 lin.ft. armored cable No. 6 s/c | .28 | .15 |
| 7,610 lin.ft. 3½ in. conduit | .75 | .59 |
| Total | $60,595 | $61,471 |

## Wabash Ave. Bascule and Viaduct, Chicago

THE Wabash Ave. bridge project in Chicago, consisting of a double-leaf trunnion bascule over the Chicago River connecting with a viaduct over railway tracks, will probably be completed this year. The final contract, for the viaduct, was awarded in July, 1930, for $529,929, to the Ketler-Elliott Co. (second lowest bidder), which is building the bridge and agrees to complete it in six months.

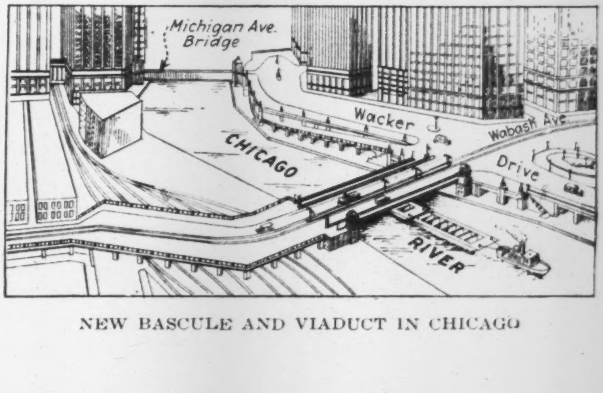
Contract for the bascule, which is 232 ft. between masonry and 90 ft. wide, including two 11-ft. sidewalks, was let in December, 1929, for $670,000. The location of the viaduct, which is of steel and concrete 400 ft. long by 116 ft. wide, is shown in the accompanying sketch.

ALL BIDS ON WABASH AVE. VIADUCT

| | Bid | Per Cent Above Low | Per Cent From Average | | Bid | Per Cent Above Low | Per Cent From Average |
|---|---|---|---|---|---|---|---|
| 1 | $516,120 | .. | −9.8 | 7 | 582,573 | 2.8 | +1.8 |
| 2 | 529,929 | 2.7 | −7.3 | 8 | 598,922 | 2.8 | +4.6 |
| 3 | 543,760 | 2.6 | −5.0 | 9 | 600,330 | .1 | +4.8 |
| 4 | 546,391 | .3 | −4.5 | 10 | 619,565 | 4.6 | +8.1 |
| 5 | 557,385 | 1.9 | −2.5 | 11 | 625,316 | 2.3 | +9.1 |
| 6 | 565,850 | 1.6 | −1.0 | Avg. | 572,000 | ... | .. |

Close estimating is shown by the table of total bids. There were eleven, the lowest being 10 per cent below the average and the highest 9 per cent above. Unit prices are given of the lowest three bidders, all of Chicago: (A) E. J. Albrecht; (B) Ketler-Elliott (award); (C) Great Lakes Dredge & Dock Co.

| | A | B | C |
|---|---|---|---|
| Permanent stone balustrades (lump sum) | $2,500.00 | $2,695.00 | $7,000.00 |
| Same as above of cast conc. stone (lump sum) | 2,000.00 | 2,345.00 | 5,000.00 |
| Genuine wr't-iron pipe railings (lump sum) | 450.00 | 1,220.00 | 1,500.00 |
| Installation of viaduct side of bridge expansion joint (lump sum) | ...... | 310.00 | 1,000.00 |
| Boulders and solid masonry excav., 15,000 cu.ft | .50 | .60 | .50 |
| General excav., 1,000 cu.yd. | 2.00 | 3.75 | 3.00 |
| Class 1 sub-piers to or above El.—75, 45,000 cu.ft | 1.45 | 1.17 | 1.25 |
| Class 2 sub-piers to or above El.—75, 48,000 cu.ft | 1.40 | 1.15 | 1.30 |
| Sheet steel casings and steel sheet piles, 40,000 lb | .10 | .06 | .07 |
| Class 1 portland cement conc., 1,550 cu.yd. | 20.00 | 19.00 | 14.00 |
| Class 1 waterproof cement conc., 3,300 cu.yd. | 22.00 | 21.00 | 19.00 |
| Class 4 portland cement conc., 460 cu.yd. | 6.50 | 7.00 | 12.00 |
| Guniting per superficial sq.yd. of steel surface covered, 80,000 sq.ft. | .25 | .31 | .40 |
| Structural carbon steel, 4,200,000 lb | .0425 | .041 | .04 |
| Cast steel, 40,000 lb | .10 | .156 | .18 |
| Gray-iron castings, 26,000 lb | .05 | .0955 | .12 |
| Reinf. metal, 600,000 lb | .04 | .05 | .05 |
| Safety treads, 1,400 lb | .10 | .20 | .30 |
| Bronzes, 30 lb | 1.00 | 1.50 | 3.00 |
| Catchbasins, 8 | 70.00 | 102.00 | 100.00 |
| Sewer manholes, 2 | 70.00 | 110.00 | 100.00 |
| 8-in. vit. clay pipe sewer, 250 ft | 1.00 | 5.25 | 5.00 |
| 12-in cast-iron pipe sewer, 200 ft | 4.50 | 8.00 | 7.00 |
| 3-in. fiber duct, 4,800 ft | .30 | .31 | .50 |
| Sand fill, 400 yd | 1.50 | 1.00 | 2.00 |
| Conc. roadway wearing surface per superficial sq.yd., 4,800 yd | 2.00 | 1.90 | 2.50 |
| Conc. sidewalk wearing surface per superficial sq.yd., 2,500 sq.yd. | .90 | 1.20 | 1.00 |
| Fluted steel light poles type P1, 14 | 150.00 | 150.00 | 225.00 |
| Fluted steel light poles type P2, 2 | 175.00 | 175.00 | 250.00 |
| Fluted steel light poles type P3, 2 | 160.00 | 150.00 | 230.00 |
| Fluted steel light poles type P4, 4 | 180.00 | 180.00 | 270.00 |
| Class 1 sub-piers below El.—75, 1,000 cu.ft. | 2.00 | 10.00 | 2.50 |
| Class 2 sub-piers below El.—75, 1,200 cu.ft. | 1.90 | 10.00 | 2.60 |
| Sub piers under pneumatic pressure process, 1,000 cu.ft | 3.00 | 10.00 | 3.00 |
| Portland cement, 500 bbl | 2.00 | 2.50 | 3.00 |
| High-early-strength portland cement, waterproof or super-portland and quick-hardening cement, 500 bbls | 3.50 | 4.00 | 5.00 |
| Mechanics' time, wages per hr., 2,400 hr. | 2.00 | 1.90 | 2.75 |
| Common laborers' time, wages per hr, 2,400 hr. | 1.25 | 1.05 | 2.00 |
| Totals | $516,120 | $529,929 | $543,760 |



NEW BASCULE AND VIADUCT IN CHICAGO

# Unit Prices From Current Construction Bids

## Riprap on Mississippi River

U. S. ENGINEER office at Memphis received bids May 20, 1930, for two lots of riprap of 25,000 cu.yd. each, the first loaded on government barges at Helena, Ark., the second f.o.b. contractor's barges at quarry, Cairo, Ill., or points on the Mississippi River between Cairo and the mouth of White River. For lot 1 the lowest bid of $1.15 on cars at quarry figured $2.5645 (awarded) at Helena. There were nine bids. Four were as follows:

| | A | B | C | D |
|---|---|---|---|---|
| On barges at quarry | $1.50 | $1.50 | $1.50 | $1.65 |
| River distance quarry to Helena (miles) | 362 | 381 | 382 | 343 |
| Total cost towage cu.yd. | 1.0848 | 1.1415 | 1.1415 | 1.0293 |
| At Helena | 2.5848 | 2.6415 | 2.6445 | 2.6793 |

The other four bids were $3.23, $3.30, $3.4989, and $3.90, the first submitting an alternate bid of $1.90 f.o.b. cars Little Rock, Mayflower and Plumville, Ark., and reloading at Helena, the final price being $2.6475 to $2.728.

The lowest and accepted bid was $1.15 at quarry within switching limits of Little Rock. The additional charges were: (1) freight at 58c. per ton or 66.7c. per cubic yard; (2) unloading to bank and loading on barges, 65c. per ton or 74.75c. per cubic yard; contract price $2.5645.

For lot 2 only one bid was received and was awarded contract. Price at Cairo was $3, and at other points on river was $3.25. Barges required were twelve steel 225x40 and six steel 225x36.

## Sewage-Treatment Works for Chattanooga

THE NEW sewage-treatment works for Chattanooga, Tenn., includes an outfall sewer, presettling and separation tanks, sludge-drying beds, buildings and connecting conduits, as shown by the accompanying illustration. Contract was awarded in June, 1930, to Gauger Korsmo Construction Co., Memphis, for $158,128. The second lowest of the six bidders was W. S. McClelland Co., Charlotte, S. C., at $158,493. The unit prices of these two contractors are listed as A and B. W. H. Wilson is city engineer, and G. B. Gascoigne consulting sanitary engineer.

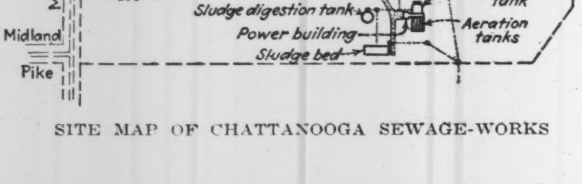
The tabulation lists the principal items, which include 10,000 cu.yd. earth excavation, 2,000 cu.yd. concrete, 100 tons reinforcement, 35,000 cu.ft. buildings, and 3,400 sq.ft. sludge-bed covering.

Item 5 provides for clearing the site, excavating for the several structures and refilling. Item 7 is a cushion of compacted slag and screenings to furnish foundations for the structures. The slag, of three sizes up to 2½-in., is placed in six layers, the largest size placed first, ending with the screenings.

Concrete is chiefly class A and is used everywhere except in copings, in stairways and in the precast slabs and posts for the sludge beds, where class B is used. The mix is 1 bbl. cement to 6 cu.ft. fine and 12 cu.ft. coarse aggregate.

Items 43 to 47 are 930 ft. vitrified pipe, with alternate (accepted) 43a to 47a concrete pipe, for which the low bidder estimated $407, compared with $466 for V.C.

Item 55 covers superstructures of pump, power and pipe gallery buildings. The walls are of brick with stone trim. Exterior walls and chimney are faced with tapestry brick, interior with buff brick or plaster. In estimating brickwork the contractor was asked to use $25 per M. for exterior facing, $30 delivered for selected buff pressed brick, and $15 for No. 1 shale building brick used in the air filter room in the basement of the power house.



SITE MAP OF CHATTANOOGA SEWAGE-WORKS

*Equipment*—Item 60 is for Venturi meter equipment as follows: one max. 3 m.g.d. for raw sewage; two 2 m.g.d. for settled sewage; two 1 m.g.d. for aerated sewage and one for sewage sludge; one 1,500 cu.ft. per minute for main air; two 750 cu.ft. for lateral air. Item 61 includes three 1 m.g.d. centrifugal sewage pumps, 26-ft. head and 10-in. suction, and two 1 m.g.d. centrifugal 8-in. sludge pumps, 30-ft. head. Items 62 and 63 for sludge-removal devices in presettling and settling tanks, respectively; two Link-Belt or equal, and one Dorr or equal. Item 64, for sludge-digestion equipment, including Downes floating cover or equal. Item 65, for 200 filtros blocks Grade R General Filtration or equal. Item 66, for sludge heating system including 770-sq.ft. boiler adapted for burning gas. Item 67, for two centrifugal air compressors of 750 cu.ft. per minute, and two 2,000-ft. dry-air filters. Item 79, for handling equipment in sludge-drying beds, of Louden Machinery make or equal. Item 80, for greenhouse superstructure covering drying-bed areas.

| | A | B |
|---|---|---|
| 5 earth excav., 10,000 cu.yd | $0.79 | $0.95 |
| 6 rock excav., 50 cu.yd | 7.90 | 6.00 |
| 7 foundation cushion, 50 cu.yd | 3.90 | 5.40 |
| 8 conc. class A, 1,850 cu.yd | 19.90 | 19.00 |
| 9 conc. class B, 75 cu.yd | 22.50 | 25.40 |
| 10 additional portland cement, 50 bbl | 3.10 | 3.00 |
| 11 expansion joints, 20 lin.ft | .79 | 2.30 |
| 12 steel reinforcement, 110 ton | 68.00 | 80.00 |
| 13 bell and spigot c.i. pipe, 42 ton | 89.00 | 73.00 |
| 43 6-in. and smaller, vitrified pipe, 200 lin.ft | .24 | .28 |
| 44 8-in. vitr. pipe, 300 lin.ft | .35 | .41 |
| 45 10-in. vitr. pipe, 300 lin.ft | .52 | .56 |
| 46 18-in. vitr. pipe, 120 lin.ft | 1.13 | 1.32 |
| 47 24-in. vitr. pipe, 10 lin.ft | 2.07 | 2.75 |
| 43a 6-in., and smaller, conc. pipe, 200 lin.ft | .24 | .34 |
| 44a 8-in. conc. pipe, 300 lin.ft | .29 | .43 |
| 45a 10-in. conc. pipe, 300 lin.ft | .42 | .58 |
| 46a 18-in. conc. pipe, 120 lin.ft | 1.05 | 1.35 |
| 47a 24-in. conc. pipe, 10 lin.ft | 2.00 | 3.00 |
| 52 misc. c. i. work, 7,000 lb | .16 | .09 |
| 53 misc. w. i., steel and aluminum work, 16,000 lb | .38 | .33 |
| 55 buildings, (lump sum) | 20,400.00 | 20,875.00 |
| 56 steam heating equip. (lump sum) | 5,510.00 | 5,015.00 |
| 57 electric wiring, (lump sum) | 5,510.00 | 5,400.00 |
| 58 plumbing (lump sum) | 1,550.00 | 1,500.00 |
| 60 Venturi meter equip. (lump sum) | 6,940.00 | 7,300.00 |
| 61 pumping equip. (lump sum) | 8,400.00 | 9,000.00 |
| 62 sludge-removal equip. for presettling tanks (lump sum) | 3,400.00 | 3,650.00 |
| 63 sludge-removal equip. sludge-settling tank (lump sum) | 6,650.00 | 6,200.00 |
| 64 sludge-digestion equip. (lump sum) | 6,020.00 | 4,800.00 |
| 65 filtros block, ea., 200 | 2.42 | 2.55 |
| 66 sludge heating equip. (lump sum) | 3,650.00 | 3,000.00 |
| 67 air compressor equip (lump sum), | 6,080.00 | 8,900.00 |
| 68 vault lights (fixed), 100 sq.ft | 6.20 | 4.60 |
| 69 vault lights (hinged), 60 sq.ft | 11.50 | 11.50 |
| 79 sludge handling equip. (lump sum), 60 sq.ft | 1,000.00 | 1,000.00 |
| 80 sludge bed covering, 3,400 sq.ft | 1.79 | 1.70 |

## Vitrified Clay Sewer in Des Moines

THE Northwest main line sewer in Des Moines, 13,881 ft. of 10- to 24-in. vitrified clay pipe, was awarded June 2, 1930, for $86,381, or 8.5 per cent below the second lowest and 3.5 below the engineer's estimate. Unit prices of Gjellefeld Construction Co., Forest City, Iowa, are given below:

| | |
|---|---|
| 6,819 ft. 24-in. V. C., incl. excav., backfill and manholes | $9.00 |
| 2,680 ft. 12-in. | 2.50 |
| 4,382 ft. 10-in. | 2.25 |
| 500 cu.yd 1 : 2½ : 4 concrete placed | 10.00 |
| 100 M ft.b.m., wood sheetpiling left in place | 30.00 |

Manholes (fifty, 275 ft. apart) and house junctions (6-in. T spur, but no pipe) are included in the price per linear foot. Joints are bituminous. Trench depths on 24-in. pipe are 9 to 18 ft. and average 14 ft. Soil is half wet clay and half saturated sand. Cuts on the double-strength 12- and 10-in. pipe are 8 to 12 ft. and average 9 ft. The 24-in. pipe is extra heavy vitrified clay, 5,000 lb. crushing strength per foot.

Payment to be in cash and 6 per cent bonds worth par or better, 30 days after acceptance. J. M. Tippee is city engineer.

# CONSTRUCTION NEWS

## *Some of the Week's Large Projects*

For further details turn to the appropriate sections in this issue

| *Location* | *Project* | *Cost* | *Status* |
|---|---|---|---|
| **Sewers** | | | |
| Chicago | Sewers | $2,596,158 | Contract |
| **Railway** | | | |
| Wyoming | Railroad yards | 1,886,000 | Contract |
| **Dams** | | | |
| Texas | Dams | 2,500,000 | Proposed |
| **Shops and Foundries** | | | |
| Pittsburgh | Machine Shop, Etc | 1,500,000 | Contract |
| **Warehouses** | | | |
| St. Louis | Warehouse | 1,500,000 | Contract |
| **Power Plants** | | | |
| Oregon and California | Power Development | 27,600,000 | Proposed |
| Buckingham (Que.) | Power House, Dam, Elec | 10,000,000 | Proposed |
| Alaska | Power Development | 3,000,000 | Proposed |
| **Buildings** | | | |
| Chicago | Apartment | 2,000,000 | Bids asked |
| Rochester (N.Y.) | Y.M.C.A. | 1,000,000 | Proposed |
| San Francisco | Club | 2,000,000 | Proposed |
| New York | Office | 4,500,000 | Proposed |
| Quincy (Ill.) | School | 1,300,000 | Bids asked |
| Cambridge, (Mass.) | University | 2,000,000 | Contract |
| San Antonio | School | 1,000,000 | Bids asked |
| Davenport, (Ia.) | Theatre | 1,500,000 | Bids asked |

## WATERWORKS

### PROPOSED WORK

**Calif., San Francisco**—L. Leavy, city purch. agt. rejected bids June 9, 16 deep well turbine pumps for Water Dpt. A. Hester, secy. Bd. P. Wks.

**Colo., Canon City**—City Council, G. K. Kellogg, clk., soon takes bids pipe line replacement in Royal Gorge, west of here, incl. 1,500 ft. 30 in. wooden pipe line and reconstructings 3,000 ft. 30 in. wooden pipe line. $80,000. C. L. Mitton, Mercantile Bldg., Denver, engr.

**Calif., Long Beach**—Surveys (1st unit) 54 m.g. reservoir on Reservoir Hill. $350,000. C. H. Shaw, supt. Muny Water Dpt. B. Harmon, city hydraulic engr.

**N. J., Kearny** (sta. Arlington)—Bd. Town Council, rejected bids 8 in. main in Kearny Ave. $105,000. Taylor & Knight, Inc., 60 Park Pl., Newark, engrs. Noted Aug. 7.

**Okla., Lamont**—Preliminary plans new drilled well water supply. $15,000. C. W. Smith, city clk.

**Okla., Wanette**—Preliminary plans well, main extensions. $15,000. A. B. Carson, Norman, engr.

**Ore., Hillsboro**—City retained Barr & Cunningham, engrs., Spalding Bldg., Portland, to make surveys, estimates, plans new waterworks or remodeling old waterworks (privately owned).

**W. Va., Moundsville**—Waterworks improvements, incl. new 1½ m.g.p.d. electric driven pumping plant, drilling wells. $50,000. D. Morrow, dist. mgr. for Supervising Eng., Inc., 42 Cedar St., New York.

**W. Va., Pennsboro**—Waterwork extensions, incl. wells, main extensions, additional storage. $40,000.

**B. C., Richmond**—Replacing wood mains with steel. $400,000 voted. J. E. Milne, 1415 Keith Rd. W., North Vancouver, engr.

### BIDS ASKED

**La., Morgan City**—Sept. 16, by M. E. Norman, mayor, and City Councilmen, waterworks and electric power plant improvements. Swanson-McGraw, Inc., 426 Balter Bldg., New Orleans, consult. engrs.; adv. E. N.-R. Sept. 4.

**Md., Baltimore**—Sept. 17 (extended date), by Bd. Awards, constructing Prettyboy Dam. E. G. Rost, Municipal Bldg., water engr. Noted Aug. 28.

**Mich., Detroit**—Sept. 23, by Bd. Water Comrs., 735 Randolph St., 1 electric motor driven centrifugal pump with auxiliary equipment, for Springwells Booster Plant. G. H. Fenkell, genl. mgr. and ch. engr.; adv. E. N.-R. Sept. 4.

**N. J., Trenton**—Sept. 10, by C. N. Leathem, state archt., Trenton, vacuum return pump and piping in tunnel and underground conduit, for 3 cottages at State Home for Boys, Jamesburg. $10,000.

**N. Y., Fishkill** — Sept. 15, by Bd. Village Trustees, 39,200 lin.ft. 6 and 10 in. waterworks, valves, hydrants, reservoir. J. P. Wells, 80 East Ave., Rochester, engr.; adv. E. N.-R. Sept. 4.

**O., Girard**—Sept. 10, by D. M. Williams, dir. P. Serv. & Safety, mains in Earl St. from Trumbull Ave. to Moser Rd.; Maple Ave. from State to St. Clair Sts.; Hazel St. from State of Washington; Trumbull Ave. from Randolph to Skoplee Sts.; Skoplee St. from Trumbull Ave. to Lot 603; Plymouth St. from Randolph to Clermont Sts.; Clermont St. from Plymouth St. to Trumbull Ave.; Trumbull Ave. from Clermont to Dearborn Sts.

**Tex., Refugio**—Sept. 16, by City, c/o J. O. West, mayor, two 6 and 8 in. pipe lines, incl. 3,940 ft. 8 in., 20,240 ft. 6 in. and 26, 620 ft. 2 in. c.i. pipe, nine 8 in., twenty-two 6 in., thirty-eight 2 in. gate valves, 30 fire hydrants. $43,000. Hawley, Freese & Nichols, 303 Frost Bldg., San Antonio, engrs.

**Wis., Milwaukee**—Sept. 9, by Dpt. P. Wks., three 2,500 g.p.m. motor driven centrifugal pumps in new fire service pumping station.

### CONTRACTS AWARDED

**Calif., Cloverdale**—For 12,080 ft. 4 in. and 5,890 ft. 2 in. c.i. pipe, miscellaneous fittings, to J. J. Ongaro, Fairfax, $16,580. Noted July 17.

**Idaho, Malad** — Malad Reservoir & Refinancing Organization, sealing Malad Reservoir, to Dravo Contg. Co., Portland, Ore., $60,000. Noted June 5.

**Ill., Chicago**—Bd. Local Impvts., City Hall, water service pipes in West 55th St., to Washington Plumbing & Heating Co., 461 North Halsted St.; Lincoln Ave., to P. J. Collins & Co., 5521 Bway.; Gregory St., South Fairfield and Vanderpail Aves., to Reliance Plumbing & Heating Co., 2450 West Van Buren St.; East 98th Place and East 98th St., to Walsh & Metzger, Inc., 6828 South Chicago Ave.

**Kan., Independence** — Waterworks improvements, incl. well, 60 ft. diam., 25 ft. deep, and metal roof on trusses, to A. G. Sherwood, Independence, $12,800. Est. $15,000.

**La., Gilbert**—Waterworks, to R. Dessell, Cheneyville, $5,500; pipe and valves, to Dixie Mill & Supply Co., 901 Tchoupitoulas St., New Orleans, $6,000; tank on tower, to Chicago Bridge & Iron Wks., Dallas Natl. Bank Bldg., Dallas Tex., and 37 West Van Buren St., Chicago, Ill., $2,800. Grand total $14,300.

***See proposal advertising on page 136***

**Md., Baltimore** — Bd. Awards, furnishing copper pipe for Bureau of Water Supply, to Baltimore Copper Mills, Danville Ave. and Baylis St., $9,851; furnishing, delivering c.i. pipe, fittings, to U. S. Pipe & Fdry. Co., Burlington, N. J., $193,885; mains in Pennington Ave., to W. H. Thompson, Relay, $27,907. Grand total $237,643. Noted Aug. 14.

**Mass., Boston**—Dpt. P. Wks., gate valves for water service, to Kennedy Valve Mfg. Co., Elmira, N. Y. $19,822.

**Mich., Detroit** — Dpt. Purchases & Supplies, 735 Randolph St., five hundred 6 in. double nozzle standard fire hydrants and eight hundred 6 in. double disc gate valves, to Michigan Valve & Fdry. Co., Clayton and Parkinson Sts., for Fire Comn., Larned St., $40,035. Noted July 17.

**Mich., Detroit**—Bd. Water Comrs., furnishing, laying 5,600 ft. 66 in., 7,100 ft. 54 in. electrically welded armco ingot iron pipe for waterworks, to A. Phelps & Son, 6319 Michigan St., exceeds $432,000. Noted July 10.

**Mich., Detroit**—Dpt. Water Supply, 4 wash water pumps for Springwells Pumping Sta., to American Well Works, Aurora, Ill., $25,546.

**O., Beachwood** (br. Cleveland)—Village, furnishing, erecting one 750 g.p.m. water pump, to J. B. Lynn Constr. Co., 16311 Saranec Rd., Cleveland, $4,050. Noted July 31.

**O., Cleveland**—Cuyahoga Co., 10,506 ft. 6 and 8 ft. c.i. mains in Brecksville Rd., Impvt. 453, to Fidelity Constr. Co., 621 Engineer Bldg., $25,469.

**O., Delta**—Laying 3,600 ft. 10 in. c.i. pipe, to M. B. Gessner, Toledo, $10,350.

**Okla., Marlow**—G. L. Orr, city clk., 14,000 ft 4- to 10-in. c.i. mains, concrete reservoir, to Robeck, Humphreys Co., Securities Bldg., Omaha, Neb., $26,288. Est. $40,000.

**Okla., Wayne**—New waterworks, to Koller Constr. Co., Tradesmens Bank Bldg., Oklahoma City, $25,670. Est. $27,500.

**Utah, Provo**—City Comn., 5 m.g. rein.-con. underground gallery type reservoir to T. G. Rowland, Salt Lake City, $72,110. Est. $85,808. Noted May 29.

## SEWERS

### PROPOSED WORK

**Calif., Los Angeles**—For 811 ft. 24 in. heavy and 103 ft. 24 in. double heavy rein.-con. pipe, inlet chamber in Alhambra Ave. Eng. Dpt. of City Park Comn., engrs.

**Calif., Redwood City**—Outfall sewer incl. 4- to 21-in. itr. and 8- to 18-in. c.i. sewers, 23,000 ft. redwood pile trestle, 130 manholes, 2 pump sumps, two 400 g.p.m. and two 1,200 g.p.m. pumps complete to serve South San Francisco, San Bruno, Lomita Park and Capuchino (into San Francisco Bay). $120,500. R. A. Klassen, Courthouse, engr.

**Ill., Woodstock**—Delayed taking bids sewage treatment plant, activated sludge, mechanical process. $95,000. Suhr, Berryman, Peterson & Suhr, 130 North Wells St., Chicago, engrs. Noted Nov. 28.

**Ind., Mitchell** — Preleminary plans sewage treatment plant. $60,000. L. B. Root, mayor.

**Ind., Newcastle** — Sewage treatment plant. $75,000. C. Hurd & Son, 1607 Merchants Bank Bldg., Indianapolis, engrs.

**O., Youngstown** — New sewerage system in Brier Hill Dist. $40,000.

**Okla., Lawton**—Squaw Creek Improvement, incl. bridging, canal, channel change, widening. F. E. Lawrence, Lawton, engr. Noted Mar. 27.

**Tex., Dallas**—City, c/o E. Goforth, secy., rejected bids outlet sewer in Warren Ave. from Wall St. to Texas & New Orleans Ry. $274,000. Will readvertise. J. B. Winder, Dallas, engr. Noted July 10.

**Tex., Galveston**—City soon takes bids 2¼ mi. alternate types, lateral sanitray sewers. Address J. E. Pearce, mayor.

**Ont., Sudbury**—Town, W. J. Ross, clk., preliminary plans 18 m.g. sewage disposal plant and destructor, incl. 7,000 ft. 48 in. sewer, 2 story, 42 x 80 ft. building half of which will be equipped for incinerator. F. A. Dallyn, 71 King St. W., Toronto, engr. $100,000. Noted May 8.

**Ont., Woodstock** — Council trunk sewer in northern part city. $85,000. F. J. Ure, city engr.

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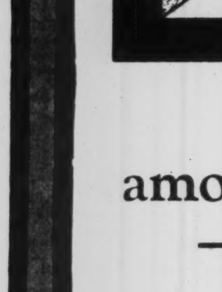
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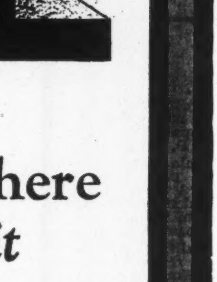

Sewers (Continued)

### BIDS ASKED

**Calif., San Francisco**—Sept. 17, by S. J. Hester, secy. Bd. P. Wks., City Hall, College Hill Tunnel Sewer, incl. 6,500 lin.ft. 4 ft. 6 in. to 6 ft. circular sewer, 4,300 of which will be in tunnel. $320,000. M. M. O'Shaugnessey, city engr.

**Ill., Chicago**—Sept. 10, by City at office Bd. Local Impvts., City Hall, tile sewers, brick manholes, catch basins in 1 alley, Gregory St., South Major, South Massasoit, Kinney, East End, Ridgeland, Constance, Bennett, Euclid, North Natoma, North Normandy, Rascher, Talcott, North New Castle, North New England, North Oak Park, North Sayre and Higgins Aves. M. J. Faherty, pres.

**Md., Baltimore**—Sept. 10, by Bd. of Awards 3,964 ft. 15, 18 and 21 in., 1,425 ft. 12 in. vitr. pipe, 4,500 ft. 6 and 8 in. underdrain, Sanitary Contr. 265. M. J. Ruark, sewerage engr.

**Mass., Boston**—Sept. 5, by Dpt. P. Wks., sewerage works in West Roxbury and Hyde Park, incl. repairs to garbage dump. $25,000 J. A. Rourke, comr.

**Minn., Willmar**—Sept. 8, by City, H. Gunderson, clk., 5,406 ft. 6- to 21-in. sewers, disposal plant, 1,243 lin.ft. 15 in. sewer tile, 3,790 lin.ft. 4 in. c.i. water main, 3 pump houses, 1,900 lin.ft. 6 in. c.i. force main, 7 manholes. $120,000. S. A. Siverts, Jr., 454 Sexton Bldg., Minneapolis, engr. Noted Aug. 14.

**Mo., St. Louis** — Sept. 16, by Bd. P. Serv., City Hall, Sect. B, Maline Creek Public Sewer, incl. 7,900 ft. 30 in. vitr. con. to 16 ft. rein.-con. horseshoe, etc. $317,000; Sect. A, Blendon Pl., Public Sewer, incl. 1,780 ft. 7 ft. rein.-con. horseshoe in open cut, 1,100 ft. 5 and 6 ft. concrete horseshoe in tunnel, $119,480. W. W. Horner, 300 City Hall, engr.

**N. Y., Brooklyn** — Sept. 10, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, sewers in Ocean Ave. and Pine St.; storm and sanitary sewers in Avenue X, W. Ocean Parkway, Coney Island Ave., West 9th, East 2nd, East 7th, East 8th, East 9th Sts.

**N. C., Warrenton**—Sept. 9, by Town, concrete settling basin. Spoon & Lewis, Greensboro, engrs.

**Pa., Phila.**—Sept. 10, by Dpt. P. Wks., Bureau Eng. & Surveys, A. Murdock, dir., City Hall Annex, Schedule A, branch sewers; Schedule B, Pennsylvania Terminal Impvt., Contr. 11, grading, paving.

**Tex., Amarillo** — City, c/o W. N. Durham, mgr., taking bids 2,400 lin.ft. 6 in. sewer extensions. E. N. Stanley, city engr.

**Ont., London**—See "Contracts Awarded."

### CONTRACTS AWARDED

**Ark., Newport**—See "Streets and Roads."

**Calif., Los Angeles**—For 8- to 15-in. vitr. sewers, manholes, in Strawberry Park Section-Co. Impvt. 781 to Cogo & Rados, 914 Sunset Blvd., $32,546.

**Colo., Dolores**—Sanitary sewerage system, to H. Hasselman, 1114 East 9th St., Pueblo. Est. $30,000. Noted July 10.

**Ill., Centralia**—Sewage treatment plant, incl. grit chamber, settling tanks, bypass chamber, trickling filter, pumping equipment, to G. E. Tillman, Centralia, $163,900. Est. $164,600.

**Ill., Chicago**—Bd. Local Impvts., City Hall, rein.-con., brick and tile sewers, brick manholes, brick catch basins, concrete bulkhead, rein.-con. diversion chambers in Bertau, North Cicero, North Spaulding, North Austin, North Melvina, Lowell and North Long Aves., to M. Pontarelli, 4848 Dakin St., $2,596,158. Noted Aug. 14.

**Ill., Chicago**—Bd. Local Impvts., City Hall, tile sewers, brick manholes in West 56th St., South Nagle and South New England Aves., to Mancini & Ventrilla; South New England and South Sayre Aves., to F. A. Coda, 6825 Indiana Ave.; South Sayre, South Nottingham, South Neva, South Harlem and Archer Aves., to J. Tiritilli, 732 South Ashland Ave.; drains in West 79th, South Washtenaw and South Seeley Aves., to N. Ranieri, 5036 Montana St.; George, Slocum and Giddings Sts., North Melvina, South Fairfield, Greenleaf, South Kilbourne, North Nottingham, North Neva, North Nordiac and Barry Aves., to P. Scalzitti, 2424 North Tripp Ave.; Gregory St., Rascher, Mulligan and Catalpa Aves., to A. Scully, 4504 Wrightwood Ave.; South Seeley and South Hoyne Aves., to Marco Divito, 5217 South Kostner Ave.

**Ill., Glen View**—Storm sewers, Glenyre subdivision, to T. R. Couts, Evanston, $65,799.

**Kan., Elkhart**—For 8- to 12-in. main sanitary sewers, laterals, also using Dickey clay pipe, to C. L. Burt, 1005 North Washington St., Hutchinson, $56,903.

**La., New Orleans**—See "Streets and Roads."

**Minn., Oliva**—City, 8,070 lin.ft. 8- to 15-in. sanitary sewer, 22 manholes, disposal plant, to Northern States Contg. Co., 312 Endicott Bldg., St. Paul, $23,301. Noted Aug. 7.

**Mo., St. Louis**—To Grant & Meinert, Fullerton Bldg., constructing Southernwestern Sewer 5 $6,433, Harlem Creek Sewer 27 $2,653, Harlem Creek Sewer 28, $3,185; to F. M. Luth, 806 Russell Blvd., Glaise Creek Storm Sewer 30 $7,074; to R. C. Micotto, 2516 Arlington Ave., Rock Creek Sewer 18, $5,252. Grand total $24,597. Noted Aug. 7.

**Mo., Vandalia**—City sewerage lift station, Fairbanks-Morse pumping equipment, to Arthur A. Dobson Co., 824 1st Natl. Bank Bldg., Lincoln, $12,000.

**N. J., Hillsdale**—Dpt. Institutions & Agencies, State Office Bldg., Trenton, storm and sanitary sewers at Hillsdale Hospital, to A. Newton Bugbee, 586 Bellevue Ave., Trenton, $29,988.

**N. Y., Long Island City**—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to Goddard & Latigo, sewers in 23rd St. $360, 119th Rd. $7,036; to Kennedy & Smith, Inc., Bradford Ave., Flushing, 52nd St. $1,896, 95th St. $4,171; to J. W. Szpantowicz, 490 Boulevard, 56th St. $1,447; to Matarazzo & Yondola, 1163 61st St., Brooklyn, 94th Ave. $6,622 to R. Tomassetti Contg. Co., 1074 60th St., Brooklyn, Baldwin Ave. $22,123; to Catapano & Ambrosio 1016 60th St., Brooklyn, 33rd Ave. $4,405, 205th St. $6,492, 222nd St. $6,340, Jordan Ave. $5,375; to DiSalvo Contg. Co., 2441 Butler St., East Elmhurst, 46th St. $76,640 to Marmouth Constr. Co., 145th Rd. $5,427; to Mannino & Pittari, 150th Ave. $145,723; to Franzese & Catapano, 184th St. $4,988, 190th St. $23,719. Grand total $322,714. Noted Aug. 21.

**N. Y., St. George**—J. A. Lynch, pres. Richmond Boro, Boro Hall, sewers in Waldron Ave., to M. L. Klostegard, Patterson Ave., Dunigan Hills, $7,382; Barton Ave., to G. Orrico, 500 Britton Ave., $1,504. Noted Aug. 21.

**O., South Euclid** (br. Cleveland)—Village, 1,700 ft. 6 x 8 ft. concrete sewers, Plainfield Rd., to Carroccio & Gaudio, 14109 Benwood Ave., Cleveland, $37,677.

**Okla., Lawton**—North Addition Storm Sewer, incl. 15- to 36-in. concrete pipe, to Sherman Machine & Iron Wks., 18 East Main St., Oklahoma City, $27,376. Noted Aug. 7.

**R. I., Providence**—Bd. Contr. & Supply, sewerage works in Blain St., to W. A. Gammino, Inc., 250 Hartford St.; Moorefield, Spokane, and Burnside Sts., to I. Capaldi, 270 Mt. Pleasant Ave. Est. $25,000.

**S. C., Greenville**—City, 20,000 lin.ft. 8- to 10-in. sanitary sewer mains, to W. A. Briggs, Capers Bldg. Noted July 17.

**Tex., Dallas**—City, c/o E. Goforth, secy., relief sewer from C. D. Cain, Sewer at Cedar Creek and Coombs Creek to Blue Bonnet Addition 1, then westerly to Barnard Blvd. to vocational school property, to Dallas Constr. Co., 3106 Commerce St., $22,941. Est. $25,700. Noted Aug. 14.

**Tex., La Porte** — City, c/o A. N. McKay, mayor, complete sewerage system and waterworks, to Gayle Bros., Post Dispatch Bldg., Houston, $61,416 and $10,115 respectively. Noted June 13.

**Wis., Milwaukee**—Dpt. P. Wks., sewers in South 16th St., to Wenzel & Henoch Constr. Co., 5025 State St., $326; South Austin St. and Concordia Ave., to Werner Co., 721 8th Ave., Wauwatosa, $455 and $2,225 respectively; Hadley St., to Zimmermann & Zimmermann, 2826 State St., $116,623. Grand total $119,629.

**Ont., London**—City Council extending sewer in Bathurst St., day labor. $50,000. W. P. Near, city engr. Noted Dec. 19.

## WASTE DISPOSAL

### PROPOSED WORK

**N. J., Far Hills**—Boro Council, Boro Hall, incinerator plant at Mine Brook, at North Branch Raritan River. $40,000.

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## BRIDGES

### PROPOSED WORK

**Mass., Andover**—Town, Dpt. P. Wks., Town Hall, concrete bridge over Shawsheen River. $25,000 or more. Engineer not selected. Morse & Dickinson, Haverhill, consult. engrs.

**N. J., Middleville**—Bd. Freeholders Sussex Co. Court House, Newton, preliminary plans rein.-con. and steel I-beam bridge over Trout Brook. $25,000. H. Snook, Court House, Newton, co. engr.

**O., Cleveland**—Cleveland, Cincinnati, Chicago & St. Louis R.R., H. Baldwin, ch. engr., Cincinnati, rein.-con. bridge at 41st St. $500,000. J. B. Hunley, c/o owner, bridge engr.

**Okla., Coyle**—State Hy. Dpt., Oklahoma City, preliminary plans rebuilding 5 span 750 ft. steel truss bridge on concrete piers over Cimarron River, recently destroyed by fire. $150,000. A. R. Losh, Oklahoma City, hy. engr.

**Texas and Louisiana**—H. L. McKee, Port Arthur, vehicular and pedestrian toll bridge over Sabine Lake from point near Port Arthur, Tex. to Louisiana. $150,000.

**Wash., Seattle**—City and Seattle Port Comn. new Bell Street Viaduct, concrete over Railroad Ave. $60,000.

### BIDS ASKED

**Calif., Maywood**—Sept. 15, by Bd. Supervs. Los Angeles Co., Los Angeles, seven 60 ft. spans rein.-con. arch or steel plate girder bridge with 60 ft. roadway, two 5 ft. walks, over Los Angeles River, north of here. $150,000.

**Florida and Alabama**—Sept. 23, by Bd. Comrs. Escambia Co. (Pensacola) Fla., 3,800 ft. concrete bridge over Perdido Bay between Cummings Point, Fla. and Lillian, Ala. W. C. Barrieneau, chn.

**Ga., Augusta** — Sept. 12, by State Hy. Bd., East Point, bridge to have 8 deck girder spans, trestle approach and 1 deck girder swing span over Savannah River at 5th or Center St. S. B. Black, bridge engr.

**Ind., Anderson**—Sept. 6, by Bd. Comrs. Madison Co., concrete arch bridge, abutments. $150,000. M. A. Steele, co. engr.

**Ind., Evansville**—Sept. 11, by Comrs. Vanderburgh Co., 2 cantilever span 290 ft. concrete, steel bridge on West Franklin St. $175,000. R. W. Meisinger, Evansville, engr. Noted July 31.

**Ind., Greenfield**—Sept. 8, by Bd. Comrs. Hancock Co., 6 bridges. $40,000. E. Warrum, Greenfield, aud.

**Michigan**—Sept. 10, by E. Benkert, resident engineer, Port Huron, MB 2 of 77-22-3, Contr. 3, two 16 ft. and one 27½ ft. spans, St. Clair Co., for State Hy. Comn., Lansing.

**Okla., Orienta**—Sept. 8, by F. W. Buttel, clk. Major Co. (Fairview) 21 span 240 ft. pile trestle bridge, 28,800 ft. timber, 11,240 ft. wood piling. $25,000. F. C. Magruder, Fairview, engr.

**Okla., Sasakwa**—Sept. 8, by E. Cooper, clk., Seminole Co. (Wewoka) 6 span 94 ft., rein.-con. bridge. $25,000. R. Grace, Wewoka, engr.

**Vermont**—Sept. 5, by Hy. Dpt., Montpelier, 70 ft. I-beam bridge over White River, Montpelier.

**B. C., Lillooet** — Sept. 10, by Pacific Great Eastern Ry., C. L. Bates, engr. maintenance and way, Squamish, sub-structure for bridge, incl. 7,500 cu.yd. excav. over Fraser River, $100,000.

### CONTRACTS AWARDED

**Arkansas**—State Hy. Comn., Little Rock, bridges in Yell and Logan Counties, to F. Luttjohann, Topeka, Kan., $42,054 and $51,459 respectively—Miller Co., to Vincennes Bridge Co., Vincennes, Ind., $102,691—Grant Co., to Jones Constr. Co., Fayetteville, $51,770. Grand total $247,974. Noted Aug. 14.

**Ia., Council Bluffs**—Pottawattamie Co., 2 pony truss bridges, 1 high truss bridge, 16 culverts, to Wickham Bridge & Pipe Co., 1905 West Bway., $40,158.

**Maine**—State Hy. Comn., Augusta, superstructure for bridge over Penobscot River at Bucksport, to American Bridge Co., 30 Church St., New York, $510,000. Noted July 3.

**Maryland** — State Roads Comn., Baltimore, bridge, Contr. P-135-37, Prince Georges Co., to Mullan Constr. Co., 3945 Greenmount Ave., Baltimore, $10,014; concrete box culvert Contr. F-132-511, Frederick Co., to M. J. Grove Lime Co., Lime Kiln, $3,185. Noted Aug. 7.

**Massachusetts**—Boston & Main R.R., W. J. Backes, ch. engr., Boston, bascule bridge over Charles River between Boston and Somerville, to Phoenix Bridge Co., 110 State St., Boston. Est. exceeds $25,000.

**Mass., Scituate**—Town, A. M. Damon, chn., rein.-con. bridge, with stone piers, Edward Foster Rd., to Lee Constr. Co., 133 Southampton St., Boston, $17,652. Est. $35,000. Noted Aug. 7.

**Michigan**—R. A. Beers, resident engr., Kalamazoo, Grade Separation 1 of 11-13-9, C-2, 160 ft. steel deck girder, to Haines & Haines, Dowagiac, for State Hy. Dpt., Lansing. $39,757. Noted July 24.

**Missouri**—State Hy. Bd., Jefferson City, bridges in Audrain, Barton, Dollinger, Carroll, Cass, Calloway, Charitan, Douglas, Dunklin, Howell, Knox, Lincoln, Lewis, Marion, Mercer, Maries, Ralls, Texas, Wayne, Worth and Stoddard Counties, to P. G. Aldridge, Kansas City, Kan., Cammeron, Joyce & Co., Keokuk, Ia., Carte-Harlin Constr. Co., West Plains, D. W. Chapman, Vienna, Ill., Clark, Kearney & Stark, Louisiana, A. W. Davis & Co., Oklahoma City, Okla., O. O. Fuller, Nevada, Independent Constr. Co., Pittsburg, Kan., E. C. Johnson Constr. Co., Carrollton, Knutson Bros., Kansas City, Koss Constr. Co., Des Moines, Ia., List & Weatherly Constr. Co., Kansas City, M. Wunderlich, St. Paul, Minn., A. W. Mosley, Kansas City, N. Davis, Sikeston, R. H. Potashnick, Cape Girardeau. Total cost $448,517. Bids rejected St. Clair, St. Genevieve, Saline, Cooper, Morgan, Cedar and Moniteau counties.

**New Hampshire**—State Hy. Dpt., Concord, 168 ft. truss super-structure bridge, Plymouth, to Kittredge Bridge Co., Concord, $21,862.

**N. H., Walpole**—State Hy. Comn., Concord, two 110 ft. rein.-con. open sprandrel arch bridge, to Robie Constr. Co., Manchester, $44,576. Noted Aug. 14.

**N. J., New Brunswick**—Bd. Freeholders Middlesex Co., Court House, bridge over Matchaponix Creek, on old Bridge-Englishtown Rd., Madison and Monroe Twps., to W. J. Wilck, 358 Lowrie St., Perth Amboy, $17,980. Est. $25,000.

**New York**—A. W. Brandt, comr. Hys., Albany, bridges on Repair Contr. 2056, Stillwater-Schaghticoke Rd., Hy. 1791, Rensselaer and Saratoga Counties, to J. J. Farley Corp., Croton-on-Hudson, $138,960, est. $174,289; on Repair Contr. 2062, Hume-Pike Rd. Part 2, Hy. 8067, Pike-Castile Rd. Part 1, Wyoming Co., to Van Deville, Sodus Point, $15,071 est. $19,638. Noted July 31, under "Streets and Roads."

**Okla., Gracemont**—Caddo Co., 5 span 86 ft. rein.-con. bridge, to G. Williams, Ralston, $38,378. Est. $40,000.

**Pennsylvania**—Bd. Comrs. Northampton Co., (Easton) and Lehigh Co. (Allentown), 0.79 mi. concrete, steel bridge over Lehigh River, at Lehigh Gap, to Parker & Graham, Inc., Highland Park, N. J., $253,341.

**Pennsylvania**—State Hy. Dpt., Harrisburg, grading, concrete surfacing 3,381 sq.yd. R-58, Allison Twp., to J. Rocco & Sons, Phila., $17,209. Noted July 3.

*Constr. News page 93a*

### Bridges (Continued)

**Pa., Phila.**—See "Streets and Roads."

**Rhode Island**—State Bd. P. Roads, Providence, constructing bridges 260, 261 and 262, in Richmon and Hopkinton, to Aberthaw Co., 80 Federal St., Boston, Mass., $108,571. Noted July 17.

**Wash., Seattle**—Bd. P. Wks., paving Warsaw St. et al, to R. Stevenson, 1237 Northlake Ave., $29,098.

**Ont., Hawkesbury** — Dpt. P. Wks., Ottawa, steel superstructure for bridge across Ottawa River, to Canadian Bridge Co., Ltd., Walkerville, $186,715.

**Ont., Toronto**—Terminal Engineer Canadian National Rys., 232 New Union Sta., erecting section bridge south of railroad tracks, Bathurst St., to Richardson Constr. Co. Ltd., Ft. John St., $171,210; steel to Canadian Bridge Co., Walkerville.

## STREETS AND ROADS

### BIDS ASKED

**Alabama**—Sept. 9, by State Hy. Comn., Montgomery, grading, grubbing, clearing, 14.42 mi. hy. between Birmingham and Jasper, and 14.37 mi. hy. between Birmingham and Leeds, 18 ft. W. Finnell, hy. dir.

**California** — Sept. 10, by State Hy. Comn., Sacramento, seal coat on existing bituminous macadam paving 15.4 mi. Shandon Rd., San Luis Obispo Co. C. H. Purcell, hy. engr.

**California**—Sept. 10, by State Hy. Comn., Sacramento, furnishing, applying seal coat on existing bituminous macadam surfacing 1.7 mi. road west of Shandon and east boundary. C. H. Purcell, hy. engr.

**California**—Sept. 17, by State Hy. Comn., Sacramento, clearing, grubbing, drainage structures, grading, untreated crushed gravel or stone surfacing 13,100 cu.yd. Mamador City-Martell Rd. C. H. Purcell, hy. engr.

**Calif., Alturas**—Rejected bids Aug. 18, grading, curbing, asphaltic concrete paving Main St. Will readvertise.

**Calif., Arcata**—L. A. Johnson, city clk., taking bids emulsified asphalt on crushed rock surfacing 140,000 sq.yd.

**Calif., Bell**—City Council taking bids and opens same about Sept. 15, improving Mayflower Ave., et. al., 50,000 sq.ft. sidewalks, 12,000 ft. curbing, 298,000 sq.ft. grading, 182,000 sq.yd. oiled macadam and disentegrated granite sub-base surfacing.

**Calif., Gilroy**—E. F. Rogers, city clk. taking bids grading, curbing, walks, 5 in. asphalt paving 500,885 sq.ft. Hanna and Rosanna Sts., et al.

**Calif., Los Angeles**—Sept. 15, by Bd. Supervs. Los Angeles Co. grading, headwalls, 9-7-7-9-in. concrete paving 805,298 sq.yd. Avalon Blvd.

**Calif., Redwood City** — City Council taking bids grading, channel fill, 5 and 7 in. concrete paving 135,000 sq.ft. 1 in. sand and 3 in. rock cushion paving 140,000 sq.ft. Hawes St., et al. in Central Park 2.

**Calif., San Diego**—Sept. 15, by Common Council, grading, curbing, guttering, sewers, watermains, wire link guard fence, culverts, walks, 6 in. asphaltic concrete paving 168,565 sq.ft. West Point Loma Blvd. H. W. Jorgensen, city engr.

**Calif., Tujunga**—Sept. 10, by City Council, grading, curbing, sidewalks, guttering, electric lighting, 6 in. concrete paving 137,100 sq.ft. Michigan Ave.

**Conn., Bloomfield**—Sept. 10, by City, grading, catch basins, vitr. pipe drains, waterbound macadam paving 3 streets. $25,000.

**Florida** — Sept. 10, by State Hy. Dpt., Tallahassee, grading, paving 4.5 mi. Atlantic Coastal Hy., Duval Co., $300,000; widening 8 mi. Orange Park Rd., Jacksonville, $25,000.

**Georgia**—Sept. 12, by State Hy. Dpt., J. W. Barnett, engr., East Point, concrete paving 10.9 mi. hy. Barrow and Oconee Counties; 10.3 mi. hy. Hall Co.

**Ill., Chicago**—Sept. 9, by City, at office Bd. Local Impvts., City Hall, concrete sidewalks, retaining walls, on one or both sides Peck Court, West 95th and 96th Places, East 71st, 117th, West 45th, 47th, 48th, 49th, 53rd, 54th, 83rd, 89th, 96th, 97th, 101st, 105th, 118th, South Halsted, North Halsted, Gunnison, Wallace, Aberdeen, South Leavitt, West Monroe, West Adams, South Morgan, South Carpenter, South May, South Ashland, South La Salle, South Green, South Peoria, South Sangamon, North Whipple, Harrison and East Illinois Sts., Racine, Vincennes, Birchwood, North Central Park, Cottage Grove, Lake Park, Eggleston, Normal, Parnell, Dorchester, Devon, Evans, North Damen, North Harding, North Hoyne, North Hermitage, Kenmore, Marquette, Octavia, Oliphant, Devon, North Le Clare, North Neva, North New England, Princeton, Touhy, Turner, Yale, North Harlem, North Melvina, North Merrimac, North Mobile, North Livingston, North Laramie, Stoney Island, South Le Vergne, South Irving, South Oakley, South Claremont, South Spaulding, South Sangamon, South Oak Park, South New Castle, South New England, South Sayre Aves. M. J. Faherty, pres.

**Ill., Chicago**—Sept. 11, by City at office Bd. Local Impvts., City Hall, grading, curbing, guttering, sewers, 8 and 10 in. concrete paving East 87th, 64th and West 123rd Sts., Anthony, Drake, South Racine, North Melvina, and North Sacramento Aves.—grading, curbing, guttering, sewers, asphalt on 6 and 8 in. concrete paving East 89th and West 56th Places, West 122nd St., North Avers, Everell, South Irving, Lincoln, Calumet, Prairie, South Karlov and South Keeler Aves. M. J. Faherty, pres.

Constr. News page 94

**Indiana**—Sept. 9, by J. J. Brown, dir. State Hy. Comn., Indianapolis, concrete, bituminous concrete or brick paving 1.083 mi. State Rd. 49, Project 180-B, 40 ft., Porter Co.

**Ind., Evansville**—Sept. 11, by Comrs. Vanderburgh Co., S. Bell, aud., concrete paving Main St. Extension. $40,365. S. Bell, Evansville, aud.

**Ind., Evansville**—Sept. 15, by Comrs. Vanderburgh Co., S. Bell, aud., concrete paving North Green River Rd. $107,000.

**Ind., Evansville**—Sept. 18, by Comrs. Vanderburgh Co., grading, bridging, 9 in. graveling 21,765 sq.yd. Kuebler Rd. $43,364. R. W. Meisinger, Courthouse, engr.

**Ind., Goshen**—Sept. 10, by Comrs. Elkhart Co., concrete paving 2½ mi. Road 57, 18 ft. $51,000. C. B. Weaver, Goshen, engr.

**Ind., Kentland**—Sept. 8, by Bd. Comrs. Newton Co., macadam surfacing William Hazel and L. C. Pierce, et al. roads, Washington Twp. $26,400. C. H. Adamson, co. aud.

**Ia., Cedar Rapids**—Sept. 11, at office Auditor Linn Co., grading 7 mi. Trunk Road X. W. H. Behrens, Cedar Rapids, co. engr.

**Ia., Jefferson** — Sept. 9, at office Auditor Greene Co., graveling 14 projects local roads, incl. 21,575 cu.yd. gravel, 153,875 units overhaul.

**Ia., Rock Rapids**—Sept. 8, at office Auditor Lyon Co., grading 6 mi. local roads.

**Ia., Sac City**—Sept. 8, at office Auditor Sac Co., graveling 5 mi. local and 9.5 mi. trunk roads. B. D. Jones, Sac City, co. engr.

**Kan., Paola**—Sept. 9, by J. L. Lowe, clk. Miami Co., improving 7.214 mi. Osawatomie-Block Benefit Dist. Rd., incl. 55,345 cu.yd. grading, 4,788 cu.yd. borrow, 2,428 cu.yd. special grading 2,140 cu.yd. rock excav., 18,430 ft. hedge grubbing. F. Poole, Court House, engr.

**Louisiana**—Sept. 16, by State Hy. Comn., Baton Rouge, grading 4.33 mi. Project 762-A, Route 259, Catahoula Parish; clearing site for Bossier City-Minden Hy., Project 1700-A, Bossier Parish.

**La., Eunice**—Sept. 17, by State Hy. Comn., Baton Rouge, concrete paving 2 mi. Project 5851, Route 26, St. Landry Parish.

**La., New Orleans**—City Council rejected bids curbing, concrete, vitr. brick surfacing 1,462 ft. Thchoupitioulas St.; sub-surface drains, manholes, handholes, cleanouts 3,370 ft. North Galvez St. Noted Aug. 14.

**Maryland** — Sept. 9, by State Rds. Comn., Baltimore, graveling 1.14 mi. Contr. S.M. 73-82, and 1 mi. SM-68-22, St. Marys Co. — sheet asphalt paving 1 mi. Contr. BC-95-72, Baltimore Co.—concrete paving 2.17 mi. Contr. K-56-22, Kent Co. H. Williar, Jr., Federal Reserve Bank Bldg., Baltimore, engr.

**Md., Baltimore**—Sept. 10, by Bd. Awards, concrete paving 13,800 sq.yd. Contr. 560. N. L. Smith, Municipal Bldg., hys. engr.

**Massachusetts** — Sept. 9, by Dpt. P. Wks., bituminous macadam paving 7,500 ft. hy. in Framingham. A. W. Dean, Dpt. P. Wks., engr.

**Mass., Amesbury**—See "Contracts Awarded."

**Mass., Haverhill**—See "Contracts Awarded."

**Minnesota**—Sept. 9, by State Hy. Dpt., St. Paul, grading 4.1 mi. S. P. 3-60-2—1.7 mi. S. P. 3-60-30—4.5 mi. S. P. 15-30—25.2 mi. S. P. 61-33.

**Miss., Canton**—Sept. 8, by Bd. Supervs. Madison Co., improving Canton-Carthage Rd.

**Miss., Kosciusko**—Sept. 11, by Bd. Comrs. Attala Co., graveling 8 mi. Natchez-Trace Hy., Beat 1—7.25 mi. Kosciusko-Vaiden-Brett-Smith May, Adams, McElroy, J. D. Walker and Fullilove Rds.—9.5 mi. Natchez-Bear Creek-McCool-Wade, Kosciusko-Vaiden-Daniels Place and Daniels Place-Vaiden-Hails Place Rds.—7.5 mi. Kosciusko-Dossville, Wire, Braswell and J. E. Brunt Rds.

**Miss., Kosciusko**—Sept. 11, by Bd. Comrs., Attala Co., graveling 8.5 mi. Kosciusko-Goodman Rd.—6.5 mi. Kosciusko-Centre-Zama Rd.—7.5 mi. Lobutcha-Wire Rd.—11 mi. Boyett-Goodman, Boyett-Durant, and Boyett-Sallis Rds.,—7.5 mi. Kosciusko-Durant—Wrigley Grabensteins Crowder, McCool Blain-Ethel Rds.—7.5 mi. Vaiden Hy. Vaiden-Zeb Gress, Craft, North Centre Wrigley-Possumneck Rds.

**N. J., Freehold**—Sept. 17, by Bd. Freeholders Monmouth Co., Court House, reconstructing Englishtown-Old Bridge Rd. 61, Sect. 1, Manalapan Twp. G. K. Allen, Jr., 60 Broad St., Red Bank, co. engr.; adv. E. N.-R. Sept. 4.

**N. J., Freehold**—Sept. 18, by Bd. Freeholders Monmouth Co., Court House, constructing 8.1 mi. Monmouth Rd., from West Long Branch to Interlaken G. K. Allen, Red Bank, co. engr.

**N. J., Union**—Sept. 9, by Twp. Com., Municipal Bldg., 7 in. rein.-con. paving 8,285 sq.yd. Washington Ave. $32,000. H. Kreh, Jr., Falls Bldg., twp. engr.

**N. Y., Brooklyn**—Sept. 10, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, grading, curbing East 26th and West 13th Sts.—grading, asphalt on concrete paving St. John's Pl., Avenue K, Lawrence, New York Aves., East 42nd, Bay 40th, East 38th Sts.—grading, granite block repaving Pacific St.

**N. Y., Delhi**—Sept. 12, by W. J. Howland, co. supt. hys., bituminous macadam paving Bloomville-North Kortright and Doonans Corner-E. Meredith Hy., Project 12, Contr. 1, Delaware Co.; adv. E. N.-R. Sept. 4.

**N. Y., Long Island City**—Sept. 8, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., grading, curbing, sidewalks, Northern Blvd., Flushing Ave., Beach, 29th, 124th, 69th, and 207th Sts.—grading, curbing, sidewalks, preliminary bituminous macadam paving 81st St.—grading sheet asphalt on concrete paving Springfield Blvd., 86th, Woodhull, Cronston Aves., 75th, 69th, 88th, 75th Sts.

**N. Y., St. George**—Sept. 10, by J. A. Lynch, pres. Richmond Boro, Boro Hall, grading, concrete paving Richmond, Page, and Norwalk Aves.

**N. D., Bismark** — Sept. 19, by City, M. H. Atkinson, aud., warrenite bitulithic on 3 in. concrete paving, rein.-con. or sheet asphalt on 6 in. concrete paving 21,900 sq.yd. Paving Dist. 11. $50,000. T. R. Atkinson, city engr.

**O., Akron**—Sept. 8, by F. E. Swineford, dir. P. Serv., grading, sidewalks, vitr. brick paving 7,300 sq.yd. Douglas St., 28 ft., $53,600; grading, curbing, ornamental lighting system, vitr. brick paving 4,750 sq.yd. Hartford Ave., 26 ft., $50,000. E. A. Kemmler, Municipal Bldg., engr.

**O., Cuyahoga Falls**—Sept. 8, by J. G. Murray, dir. P. Serv., grading, curbing, sewers, sidewalks, asphalt or brick paving 1,250 ft. Broad Blvd., 20 ft. $26,500. A. E. Ranney, city engr.

**O., Millersburg**—Sept. 5, by Comrs. Holmes Co., gravel resurfacing Sect. A. Co. Hy. 316, Holmesville-Shreve Rd. $25,000.

**Oklahoma**—Sept. 9, by State Hy. Dpt., Oklahoma City, 5,625 tons screenings for 20 mi. U. S. Rd. 277, Comanche Co. $28,000. A. R. Losh, hy. engr.

**Okla., Wewoka**—Sept. 8, by E. Cooper, clk. Seminole Co., graveling 13 mi. Road 53, 18 ft. $30,000. R. Grace, Wewoka, engr.

**Pa., Blairsville**—Sept. 6, by A. Trump, secy. Bd. Supervs. Derry Twp., at Court House, Greensburg, rein.-con. paving 1 mi. Peanut-New Derry Rd.

**Pa., Creighton**—Sept. 5, by W. Orris, secy. East Deed Twp. Comn., grading, curbing, foot walks, sewers, concrete paving 7,500 sq.yd. Crawford Run Rd., East Deer Twp. R. M. Douglass, Columbia Bank Bldg., Pittsburgh, engrs.

**Pa., New Eagle**—Sept. 12, by P. E. Berry, boro secy., grading, curbing, walks, sewers, brick on asphalt filler paving 380 sq.yd. rein.-con. paving 1,085 sq.yd. Main and Chess Sts.

**Rhode Island**—Sept. 10, by State Bd. P. Roads, Providence, bituminous macadam paving (penetration method), 3.2 mi. F.A.P. 64-A, Contr. 3026, Foster, 6 mi. Federal Aid Project 66-A, Contr. 3012, Scituate—3.5 mi. Federal Aid Project 68-A, Contr. 3030, North Smithfield; adv. E. N.-R. Sept. 4.

**Tex., Amarillo** — Taking bids alternate types paving 8 blocks 7th Ave. from Van Buren to Jackson Sts. and North Garfield St. from Wichita to 8th Sts., 30 ft. $35,000. E. N. Stanley, City Hall, engr.

**Wash., Seattle**—Bd. P. Wks., bids about Sept. 17, grading, concrete paving Brandon St. and filling Fairview Ave. $152,700. O. A. Piper, city engr.

**Ont., Orillia**—Sept. 8, by James Proctor & Redfern, engrs., 1104 Excelsior Life Bldg., Toronto, alternate types paving 0.75 mi. Barrie Rd. and Coldwater St., 45 ft. $45,000.

### CONTRACTS AWARDED

**Ala., Birmingham**—City Comn., 2 in. asphalt on 5 in. concrete paving 6 blocks 1st Ave. N., also 3 blocks 14th St. N. and 14th St., S., 30 ft., to Dunn Constr. Co., Lincoln Life Bldg., $21,107 and $10,107 respectively, est. $46,000 and $17,750 respectively. Noted July 17.

**Ariz., Phoenix** — Grading, bitulithic paving Jefferson St., to J. C. Steele Constr. Co., Phoenix, $75,663.

**Arkansas**—State Hy. Comn., Little Rock, concrete paving 7 mi. Aragould-Hopkin Rd., to J. P. McNulty, 2121 Cherry St., Pine Bluffs, $130,732—5 mi. White Co., to J. Stanton Constr. Co., Leavenworth, Kan., $72,532—grading 7 mi. Logan Co., to G. W. Nickels & Son, Cottage St., Hot Springs, $65,807—6 mi. Pike Co. to A. V. Martin, Benton, $69,615. Grand total $338,686.

**Ark., Newport**—Bd. Comrs. Street Impvt. Dist. 14 (3rd St.), grading, curbing, guttering, sewers, concrete paving 15,500 sq.yd., to James Stanton Constr. Co., Leavenworth, $46,394. Est. $55,000. Noted July 31.

**Ark., Newport**—Bd. Comrs. Street Impvt. Dist. 15, grading, curbing, sewers, concrete paving 19,600 sq.yd., to T. J. Jones & H. Brown, North Little Rock, $41,870.

**California** — State Hy. Comn., Sacramento, grading, oil treated crushed gravel or stone on crusher run surfacing 1 mi. road through Newcastle, also 531 ft. tunnel, Placer Co., to T. M. Morgan Paving Co., Los Angeles, $209,755—37.9 mi. road between second crossing Guyman River and easterly county line, San Luis Obispo Co., to Lang Transportation Co., 5501 Santa Fe Ave., Los Angeles, $261,613—widening with bituminous treated rock border 3 ft. on each side 4.3 mi. Castaic School-Santa Clara River Rd., Los Angeles Co., to Southwest Paving Co., Washington Bldg., Los Angeles, $16,425—bituminous treatment surfacing 2.9 mi. Placer Co., to A. Teichert & Son, 1846 37th St., Sacramento, $4,092—6.2 mi. Fresh Pond-Riverton Rd., El Dorado Co., to F. C. Adams, Angels Camp, $5,994. Grand total $497,879. Noted Aug. 7.

**Streets and Roads (Continued)**

**Calif., Long Beach**—Curbing, guttering, walks Washington St. between Orange and Cherry Aves., to P. P. Janich, 2001 Eucalyptus Ave., $28,740.

**Calif., Los Angeles**—Los Angeles Co., grading, asphaltic concrete paving Richfield and Ocean Aves., also portion of Carmentina Rd., to Griffith Co., Ry. Exch. Bldg., $49,870 and $62,830 respectively; Main St. south of Artesia, to Curtis Paving Co., 2440 East 26th St., $121,738. Grand total $234,438.

**Calif., San Clemente** — Macadam surfacing 1,000,000 sq.ft. golf course section ,to D. Mulherron, San Clemente, $35,000.

**Calif., Santa Ana** — Curbing, walks, street lighting, 6 in. concrete paving 1st St., to H. C. Reid & Co., 334 North Normandie Ave., $41,645.

**Ill., De Kalb**—Grading, curbing, guttering, sewers, concrete walks, concrete paving 7,040 sq.yd. Oak St., to A. E. Rutledge Rockford, $15,171. Noted July 24.

**Ind., Crown Point**—Bd. Comrs. Lake Co., concrete surfacing 2 mi. F. C. McLaughlin Rd., to A. R. See Constr. Co., Hammond, $63,837. Noted July 31.

**Ind., Goshen**—Bd. Comrs., Elkhart Co. concrete surfacing 10,276 ft. D-3 Rd., to Bontrager Constr. Co., Elkhart, $34,780.

**Iowa**—State Hy. Comn., Ames, grading, flumes, concrete paving 4.1184 mi. U. S. Road 32, to Booth & Olson, Insurance Exch. Bldg., Sioux City, $78,476.

**Ia., Red Oak**—Montgomery Co. grading sections of trunk and local roads, to N. C. Nelson, Fremont, Neb., $28,651.

**La., New Orleans** — City Council, concrete, Uvalde rock asphalt paving 6,060 sq.yd. South St. Patrick St. and 5,875 sq.yd. Calhoun St., to Southern Uvalde Co., New Orleans Bank Bldg., $36,220 and $24,934 respectively—sidewalks on Calhoun St., to Globe Constr. Co., Louisiana Bldg., $4,860—sub-surface drains, manholes, handholes, cleanouts in Monroe St., to H. P. and J. F. Egan, New Orleans, $24,840—Calhoun St., to F. D. King, New Orleans, $12,190. Grand total $103,044. Noted Aug. 14.

**La., New Orleans**—To Craven & Lang, New Orleans Bank Bldg., concrete warrenite bitulithic paving State St. $23,810—to Southern Uvalde Co., New Orleans Bldg., 6,880 sq.yd. North St. Patrick St. $38,120; 3,160 sq.yd. South Johnson St. $17,790—to Globe Constr. Co., Louisiana Bldg., sidewalks on State St. $3,570; South Johnson St. $4,890—to F. D. King, New Orleans, sub-surface drainage system in South Johnson St. $3,120. Grand total $91,300.

**La., New Orleans**—To Craven & Lang, New Orleans Bank Bldg., stone curbing, warrenite bitulithic paving 5,510 sq.yd. Feret St. $43,610; 16,180 sq.yd. Monroe St. $94,280—to Southern Uvalde Co., New Orleans Bank Bldg., concrete curbing, concrete and Uvalde rock asphalt paving 7,590 sq.yd. North Calvary St. $45,580; 8,670 sq.yd. Octavia St., $47,980; Feret St. $18,890—to Globe Constr. Co., Louisiana Bldg., concrete paving 2,260 sq.yd. Camp St. $19,780; sidewalks on same $4,950, sidewalks on Feret St. $4,420 and Sect. 2 same street $7,800—to J. F. Campbell, New Orleans dead reef shell paving Paris Ave. $30,500—to F. D. King, New Orleans, sub-surface drainage system in Feret St. $17,400; Sect. 2, Feret St. $6,420; Camp St. $2,660—to J. B. Money, 3600 Dumaine St., sub-surface drains, manholes, hand-holes, clean outs Feret St. $29,180. Grand total $373,460.

**Me., Portland**—Granite block paving 5,600 sq.yd. Deering Ave., to R. Kennedy & Co., Inc., Portland. Est. $25,000.

**Maryland** — State Roads Comn., Baltimore, graveling 2 mi. Contr. Ch-90-82, Charles Co., to L. R. Colbert, Fredericksburg, Va., $11,665; 2.1 mi. Contr. Sm-65-84, St. Marys Co., to Pembroke & Gasparovic, Park Hill, $11,643. Noted July 24.

**Maryland** — State Roads Comn., Baltimore, penetration macadam resurfacing 1.04 mi. Washington Co., to Bester-Long Co., Hagerstown, $18,863. Noted July 31.

**Md., Baltimore**—Bd. Awards, concrete paving 10,650 sq.yd. Contr. 550, to Arundel Constr. Co., 910 Trinity St., $29,745. Noted Aug. 7.

**Massachusetts**—Dpt. P. Wks., Boston, gravel and bituminous macadam paving 4,862 ft. hy. Petersham and 4,183 ft. Carlisle, to Revere Excav. Co., 16 Allston St., Revere, $20,785 and $5,305 respectively—bituminous macadam paving 5,650 ft. Westboro, to H. and J. P. Green Co., 1 Mt. Hope Terrace, Worcester, $27,488—6,647 ft. Georgetown and 6,521 ft. Haverhill, to R. G. Watkins & Son, 47 Main St., Amesbury, $33,384 and $54,920 respectively—bitulithic on waterbound macadam surfacing 3,150 ft. Rehoboth, to Clark & Rocklin, 125 South Main St., Fall River, $16,445—rein.-con. cattle pass and bituminous macadam paving 150 sq.yd. Sutton, to Guaranty Constr. Co., Shirley, $5,267. Grand total $163,594.

**Mass., Amesbury**—Town, bituminous macadam paving High St., separate contracts. $25,000-$30,000.

**Mass., Boston**—Dpt. P. Wks., J. A. Rourke, comr., bitulithic paving Belgrade Ave., to J. C. Coleman & Son Co., 1620 Tremont St., Roxbury, $19,288. Est. $25,000.

**Mass., Boston**—Dpt. P. Wks., sheet asphalt paving Rutland St., Wards 4 and 9, to H. F. Malley, 96 Tyndale St., Roslindale, $29,476; Basswood St., to M. F. McGinnis, 65 Pershing Rd., Jamaica Plain, est. $25,000.

**Mass., Boston**—Dpt. P. Wks., sheet asphalt paving Rutland, Milford Sts., Wards 3, 4 and 9, to A. Singarella, 22 Tremlett St., Dorchester, $29,582. Former contract rescinded. Noted Aug. 28 under "Contracts Awarded."

**Mass., Boston**—Dpt. P. Wks., J. A. Rourke, comr., bitulithic paving Arborway, Easterly Dr., to Warren Bros. Co., 38 Charles River Rd., Cambridge. Est. $25,000.

**Mass., Chelsea** (br. Boston)—Street Dpt., City Hall, concrete paving Garfield Ave., to J. McCourt, 910 Huntington Ave., Boston. Est. $40,000. Noted Aug. 7.

**Mass., Chelsea**—Concrete repaving Marginal St., to J. McCourt Co., 910 Huntington Ave., Boston. Est. $45,000.

**Mass., Haverhill**—Town, G. L. Martin, comr., City Hall, bituminous macadam paving Hamilton Ave., Union, South Prospect, and Hasitine Sts., separate contracts. $50,000.

**Michigan** — E. D. Crandall, resident engr., Cadillac, grading, 2 course graveling 6.424 mi. FO57-17, C-1 and FO57-17, C-2, Missaukee Co., to C. G. Bridges, Escanaba, for State Hy. Dpt., Lansing, $86,080. Noted July 24.

**Minnesota**—State Hy. Comn., St. Paul, concrete paving 12,600 sq.yd. State Project 11-40, near Eveleth, to R. Maturi, Chisholm, $40,256. Noted July 24.

**Minn., New Ulm**—Curbing, guttering, paving 13,008 sq.yd., to Woodrich Constr. Co., 808 Metropolitan Life Bldg., Minneapolis, $42,786.

**Minn., St. Paul**—C. A. Carlson, city purch. agt., asphalt paving University Ave. between Snelling and Prior Aves., to C. F. Sculley Equipment Co., 212 Dakota Blk., $33,500—University Ave. from Lexington to Snelling Aves., to Thornton Bros. Co., 1343 Dayton Ave., $30,587—University Ave. between Vandalia St. and city limits, to Fielding & Shepley, 216 University Ave., $68,600. Grand total $132,687.

**Miss., Jackson**—To Dunn Constr. Co., 15,000 sq.yd. 2 in. asphaltic concrete paving at $2 per sq.yd.—to Merrill Eng. Co. Jackson, 600 sq.yd. 4 in. concrete sidewalks $1.30, 1,400 ft. curb and gutter $0.65—to G. L. Root, Jackson, 1,200 sq.yd. 4 in. concrete sidewalks $1.28, 1,300 ft. curbing $0.34.

**Miss., McComb**—Concrete paving 6,830 sq.yd. Scott and Argyle Sts., to Merrill Eng. & Constr. Co., Jackson. Noted July 17.

**Mo., Clayton**—St. Louis Co., County Court, rein.-con. paving 24,482 sq.ft. Page Ave. to Moore Bros. Contr. Co., 2000 St. Clair Ave., East St. Louis, Ill., $209,493—4,006 ft. Woodson Ave., to W. A. Riley Constr. Co., 6635 Delmar Blvd., St. Louis, $30,940—9,021 ft. Florissant Rd., to C. A. Moreno, Syndicate Trust Bldg., St. Louis $92,258—960 ft. Natural Bridge Rd., to W. Watters, 2611 South Kingshighway, St. Louis, $21,411—1.322 mi. Lockwood Ave., to Crean & Scott Constr. Co., 1242 Sublette Ave., St. Louis, $11,255. Grand total $365,357. Noted Aug. 7.

**Mo., St. Louis**—Bd. P. Serv., concrete paving alleys in City Blocks 4065-4079, to Bridges Asphalt Paving Co., 1411 Central Industrial St., $9,918—City Block 2872, to Chase Contr. Co., 5230 Devonshire Ave., $3,559—City Blocks 3895, 4091, 4892, and 5313N to Ansbro & Maguire, Title Guaranty Bldg., $17,401—City Blocks 4142, 5448, 5533, to Perkinson Bros. Constr. Co., 3237 Carter Ave., $14,885—City Block 2913, to Eyerman Contg. Co., 1210 South Grand Blvd., $4,476. Grand total $50,239. Noted Aug. 7.

**Neb., Gothenburg**—For 6 in. concrete paving 9,430 sq.yd. Dist. 3, to Yant Constr. Co., 905 Omaha Natl. Bank Bldg., Omaha, $26,260.

**Nevada**—Directors State Hy. Dpt., Carson City, grading, graveling 20.22 mi. Crystal to West Slope Mormon Mesa, Clark Co., to Nevada Paving Co., Reno, $32,800, est. $39,977; 2.54 mi. road from Sparks to Vista Route 1, Sect. B4, Washoo Co., to Nevada Rock & Sand Co., Reno, $24,912, est. $20,645.

**New Hampshire**—State Hy. Comn., Concord, 7 in. one course rein.-con. on 8 in. gravel paving 8,539 sq.yd. Daniel Webster Rd., Concord, to Robie Constr. Co., Manchester, $22,717 est. $32,000; 3 in. crushed gravel on 5 in. gravel paving 8,457 sq.yd. State Aid Rd., Litchfield, to Winslow & Cummings, Nashua, $18,667. Est. $35,000. Noted Aug. 14.

**N. J., Hackensack**—Bd. Freeholders Bergen Co., Court House, grading, bituminous macadam paving Brookside Ave., to T. Adametz, Market St., East Paterson, $37,398; Spring Valley Rd., Park Ridge, to J. A. Holmes Constr. Co., 38 West Main St., Bergenfield, $18,177; sheet asphalt paving Summit Ave., to Consolidated Production Corp., 162 Beech St., Hackensack, $46,277. Grand total $101,852.

**New York** — A. W. Brandt, comr. Hys., Albany, concrete paving 0.638 mi. Erie Co., to Liberto & Carullo, Inc., Depew, $71,181 est. $97,606—5.59 mi. Suffolk Co., to H. W. Patterson, Ellicott Sq., Buffalo, $343,074 est. $458,904—4.98 mi. Westchester Co., to D. Arrigoni, Middletown, Conn., $427,649 est. $544,647—10.88 mi. Suffolk Co., to Arborio Road Constr. Co., Inc., 408 Main St., Hartford, Conn., $283,794 est. $426,712—1.78 mi. Albany Co., to E. V. Cary, Albany, $75,695 est. $101,766—2.77 mi. Nassau and Suffolk Counties, to Westchester Constr. Co., Farmingdale, $157,272 est. $219,507—6.19 mi. Fulton Co., to Lane Constr. Co., 134 State St., Meriden, Conn., $264,282 est. $381,692—grading, graveling concrete paving 6.94 mi. Sullivan Co., to E. H. Anderson, Glens Falls, $462,123 est. $545,648. Grand total $2,085,070. Noted July 31.

**N. Y., New York**—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., asphalt paving Pelham Parkway and concrete paving West 233rd St., to C. D. Beckwith, Inc., Seneca Ave. and Edgewater Rd., $94,223 and $6,436 respectively—granite block paving West 169th St., to Casper Helbock, 633 Wales Ave., $8,271—grading Hicks St. and Wallace Ave., to C. Turiano Contg. Co., 2913 Coddington Ave., $11,269 and $17,951 respectively—Osborne Pl., to Perroto Contg. Co., $7,967—Middletown Rd., to F. Mascali & Son, 645 East Tremont Ave., $21,663. Grand total $167,780. Noted Aug. 21.

**N. Y., St. George**—J. A. Lynch, pres. Richmond Boro, Boro Hall, paving Holland Ave., to J. E. Donovan, 2207 Richmond Terrace, Port Richmond, $15,806; Arthur Kill Rd., to J. Johnson Sons, 455 Bway., West New Brighton, $24,683. Noted Aug. 28.

**O., Akron**—F. E. Swineford, dir. P. Serv., grading, curbing, ornamental lighting, vitr. brick paving 6,300 sq.yd. Greenwood St., et. al. and 19,000 sq.yd., Mull Ave., et al, to McAlonan Bros., 506 Woodland Ave., $39,789 and $83,675 respectively, est. $49,000 and $109,000 respectively—11,000 sq.yd. East Market St., to P. Maline, 52 Hoover St., $24,820 est. $25,000—Texaco paving 15,400 sq.yd. Hawkins Ave., to Columbus Asphalt Paving Co., 304 Buckeye Bldg., $61,327 est. $83,000—grading, guttering, Trinidad asphalt paving 6,700 sq.yd. Kenmore Blvd., South Side, to T. E. McShaffrey Constr. Co., 173 South Forge St., $28,638 est. $41,000. Grand total $238,249.

**O., Cleveland**—City, oil asphalt paving, Carnegie Ave., to Freshwater Co., Davis & Farley Bldg., $34,251—Rodman Court, to Gould & Maybach, 16311 Saranec Rd., $2,800—West 56th St., to Baldwin Bros., Union Trust Bldg., $28,433. Grand total $65,484.

**O., Columbus** — W. H. Duffy, dir. P. Serv., grading, curbing, water and sewer connections, Mexican asphalt paving 8,750 ft. King Ave., 30 ft., to B. F. Patterson Co., 999 West Goodale St., $123,645.

**O., Columbus**—W. H. Duffy, dir. Serv., grading, curbing, laying water and sewer connections, asphalt paving 4,875 ft. Duxberry and Hamilton Aves., 30 ft., to Cleveland Trinidad Paving Co., Grand Theatre Bldg., $39,211.

**O., Dayton**—Sheet asphalt on concrete paving Grand Ave., to Republic Asphalt Co., Antioch St., $17,786; brick on concrete paving West 5th St., to V. C. Smith, 209 South Perry St., $16,400.

**O., Miles Heights** (br. Cleveland)—Village, 2½ in. brick paving East 153rd, East 154th and East 155th Sts., Starr and Emery Aves., to Highway Constr. Co., Builders Exch. Bldg., Cleveland, $126,445. Noted July 10.

**O., Toledo**—Lucas Co., to S. E. Johnson Co., Terminal Bldg., sheet asphalt paving Sylvania Ave. $215,155; Lasky Rd. $25,894; macadam paving Monclova Rd., $213,340 — to A. S. Langenderfer, West Brancroft St., Hill Ave., $261,000; sheet asphalt paving Bancroft St., $109,034—to F. Judge, 1423 Vassar Dr., macadam or asphalt paving Coder Rd., $42,553; macadam paving Salisbury Rd. $8,987; and Strayer Rd., $23,809—to Harris & Tansey, Security Bank Bldg., brick paving Summit St., $239,128—to Launder & Son, 232 Vine St., improving roads in Woodmont Park, $39,909—to Peters Bros., 729 Ewing St., Pickle Rd. $57,478 and Chesterfield Ave., $11,911—to E. LaBoiteaux, 4926 Lewis St., Harley Rd., $27,567—to Thompson Paving Co., concrete paving Talmadge Rd., $87,716—to H. P. Streicher Co., Inc., Terminal Bldg., Westwood Ave., $55,965—to McKechnie-Pierce Co., Nicholas Bldg., roads in Radnor Park, $11,698. Grand total $1,431,144.

**O., Wooster**—Wayne Co., gravel resurfacing 29 mi. secondary roads, 20 ft., to F. Redick, Wooster, $27,620. Est. $30,000.

**Oklahoma**—State Hy. Dpt., Oklahoma City, to Yancey Constr. Co., Abilene, Kan., grading, drainage structures 25.25 mi. roads in Beaver Co., $59,932 est. $65,000; 23 mi. U. S. Hy. 64, $37,226 est. $43,000; 14 mi. U. S. Hy. 54 $43,343 est. $50,000, both Texas Co. Grand total $140,501. Noted Aug. 15.

**Okla., Cordell**—Caddo Co. grading, drainage structures 16 mi. Gracemont Rd., 30 ft., to Maney & Alley, Empire Bldg., $88,727. Est. $100,000.

**Pa., Glassport**—Allegheny Co., grading, curbing, sewers, 4 in. brick on 6 in. concrete paving 0.25 mi. and 8 in. rein.-con. paving 0.13 mi. 2nd, 3rd, 4th and 9th and Indiana Aves., to McCrady Rodgers Co., 300 6th Ave., Braddock, $38,518.

**Pa., Phila.**—Dpt. P. Wks., Bureau Hys., A. Murdock, dir., City Hall Annex, to J. Devlin, Hancock and Thompson Sts., preparing streets to receive gravel in First Highway Dist., $6,859—to Mack Paving & Constr. Co., Luzerne and C Sts., asphalt paving (assessment work) Erdick St. $2,781—to Barber Paving Co., Hunting Park at E St., Hegerman St. $4,088; F and Venango Sts. $9,617—to Municipal Constr. Co., Washington Square Blk., Hope St. $2,294; St. Luke St. $1,340; Tulpehocken St. $2,131—to Union Paving Co., Broad and Stiles Sts., country road improving Chandler and Naple Sts. $12,787; Cinnaminson St. $1,961—to Frank Mark Contg. Co., Eastern Ave. and Winghocking St., Elberson St. $4,655; Fuller St. $2,724; South Mt. Pleasant St. $4,740—to F. R. Curtis, State Rd. and Unruh St., improving portions Holme Ave. $10,104—to Bailey Dairs Co., 1528 Walnut St., furnishing, placing c.i. bases for street signs, $394—to G. Dabbin, 1020 South 47th St., fabricated structural steel for Hunting Park Avenue Bridge $1,810. Grand total $68,285. Noted Aug. 14.

*Constr. News page* 95

Streets and Roads (Continued)

**S. D., Aberdeen**—City Auditor, paving Washington St., to Booth & Olson, 620 Insurance Exch., Sioux City, Ia., $17,002.

**Tex., Fort Worth** — Rein.-con. paving Grapevine Rd. between Race St. and eastern city limits, to General Constr. Co., Capps Bldg., $51,593.

**Tex., Houston** — City Council, 2 in. rock asphalt on 6 in. concrete paving Crawford St. from Texas to Leeland Sts., to Uvalde Rock Asphalt Co., 820 Dowling St., $50,694—graveling Whitty St. from point 700 ft. north of Liberty Rd. to Jewell St., Baer St. from Sydnor to Clark Sts. and Clark St. from Baer to Cline Sts., to Griswold Bros., 3840 Polk St., $3,123—enlarging rotary dryer at North Side sewage disposal plant, to Perkins Dryer & Engineering Co., $4,075—storm sewer in Sidney St. from Leeland to Pierce Sts., to C. K. Horton & Co. Inc., 2202 Clay St., $1,192. Grand total $59,804.

**Tex., Port Arthur**—City, P. W. O'Neal, mayor, surface treating 460,000 sq.yd., to McKenney & Parmlee, Nacogdoches, $71,208. Noted Aug. 7.

**Utah**—State Rd. Comn., Capitol Bldg., Salt Lake City, grading, surfacing 6,939 mi. Midland Trail, Grand Co., to Hall & Co., Mesa, Colo., $73,098. Est. $94,152.

**Wis., Milwaukee**—Dpt. P. Wks., improving North 59th St. and North Story Parkway, to Schwerm Bros., 1703 Weil St., $6,311 and $4,085 respectively — North 28th and West Hadley Sts., to Bodemann Constr. Co., 1101 55th St., $9,827 and $11,941 respectively — West Euclid Ave., to Czerwinski Constr. Co., 816 Clinton St., $23,095—West Locust St., to Blech Constr. Co., 1537 Sherman Blvd., $5,537—South Rhode Island Ave., to Gumz & Switalski, 831 13th Ave., $4,786—North 5th and West Cherry Sts., to White Constr. Co., 68 East Wisconsin Ave., $11,160 and $2,358 respectively—North Milwaukee Ave. and unnamed street, to Badger Constr. Co., 97 East Wisconsin Ave., $16,497 and $31,145 respectively — West State and West Vliet Sts., to W. F. Hunt, 441 Bway., $30,117 and $4,312 respectively. Grand total $161,171.

**W. Va., Fayetteville**—Fayette Co., penetration macadam surfacing 4 mi. Layland-Clifftop Rd., to West Virginia Tar Products Co., Charleston, $37,217.

**Wyoming**—State Hy. Dpt., Cheyenne, grading, bridging 7,465 mi. Rock Springs-Pinedale Rd., Sublette Co., to Midland Constr. Co., Casper, $31,893; 5,794 mi. Sundance-Carlile Rd., Crook Co., to Sharrock & Purcell, Casper, $73,455.

## EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

### PROPOSED WORK

**Ill., Hillsboro**—Shoal Creek D. D. Montgomery Co., c/o Commissioners, soon takes bids 4 mi. main ditches, reclaiming 2,165 acres in Hillsboro and Grisham Twps., incl. 750,000 cu.yd. excav. $86,500. J. W. Dappert, Taylorville, engr. Noted Dec. 5.

**La., Shreveport**—Caddo Parish Levee Bd. soon takes bids 2 mi. levee 15 ft. high, incl. 250,000 cu.yd. excav. $60,000.

**Wash., Seattle**—W. B. Severyns, supt. Water Bd. asked for $50,000. appropriation cleaning Lake Youngs.

### BIDS ASKED

**La., Opelousas**—Sept. 22, by Comrs. Prairie Basse Gravity D. D. 15, St. Landry Co., 35 mi. drainage canals 6 to 30 ft. bottom width, incl. 600,000 cu.yd. earth. M. J. Goudeau, Opelousas, engr.

**Miss., Ripley**—Sept. 12, by Tippah Co. Comn., drains, canals 135,000 cu.yd. excav., in New West Hatchie & Owl Drainage Dist. F. A. Livingston, Louisville, engr. Noted Apr. 24.

### CONTRACTS AWARDED

**Conn., Hartford**—City, Bd. Contr. & Supply, dike in South Meadows, to Huffman Constr. Co., 556 Terminal Tower, Cleveland, O., $590,539. Noted July 24.

**Ill., Taylorville**—Clear Creek Special Drainage Dist., c/o A. M. Bloxam, clk. Christian Co., 11.8 mi. clean out work, incl. 122,516 cu.yd. excav., to W. Rowe, 513 Krietzer Ave., Bloomington, $7,351; 2,040 ft. 10- to 15-in. vitr. clay salt glazed drain tile, 2 brick catch basins, rein.-con. header walls, to Danville Brick Co., Danville, $1,555.

**Ill., Wyoming**—Spoon River Drainage & Levee Dist., 500,000 cu.yd. excav., to L. E. Sternberg, Creston, Ia.

**Ind., Tipton** — Fred Tolle Ditch in Liberty Twp., incl. 4 mi. open ditch, 32,394 cu.yd. excav., to C. Wildman & Son, Deedsville.

**N. Y., New York**—A. Cosgrove, comr. Dpt. Docks, Pier A, Battery Pl., dredging slips to Pier 3, Contr. 1957, to Great Lakes Dredge & Dock Co., 17 Battery Pl., $31,510.

**Tenn., Memphis** — Cairo River Dist. (Ohio River Front) 800,000 cu.yd. excav., to A. Guthrie & Co., Inc., 1300 Builders Exch., Bldg., St. Paul, Minn.

**N. B., North Head**—Dpt. P. Wks., Ottawa, Ont., extending breakwater, to T. P. Charleson, 179 Gilmour St., Ottawa, Ont.

*Constr. News page* 96

**Quebec**—Dpt. P. Wks., Ottawa, dredging at Verdun, to Cummings & Robertson, 70 Lombard St., Toronto, Ont., $23,450; wharf extension and protection pilework, Rimouski, to Farley & Grant, Bank National Bank Bldg., Ottawa, Ont., $34,000; wharf extension at Notre Dame de L'Isle, to Letourneau & Renault, Montniaguy, $8,036; wharf repairs, Lachnie, to Leger & Charlton, Ltd., 400 Notre Dame St., Montreal, $9,196. Grand total $74,682.

## Public Bond Elections

### *Coming Bond Elections*

**Filtration Plant, Dam, Etc.**—Osceola, Ia., Sept. 10, $50,000.

**Filtration Plant, Etc.** — Chickasha, Okla., $148,690.

**Storm Sewer and Bridge**—Sherman, Tex., Oct. 7, $70,000.

**Viaduct** — Kansas City, Mo., November, $1,500,000.

**Airport**—Los Angeles, Calif., November, $4,000,000.

**Garbage Incinerator** — San Francisco, Calif., November, $1,000,000.

**Jail** — City and County, Calif., November, $850,000.

**School**—Thomasville, Ga., Sept. 25, $150,000.

### *Bonds Voted*

**Purification Plant, Etc.** — Brownsville, Tex., $150,000.

**Sewers**—Omaha, Neb., $200,000.

## FEDERAL GOVERNMENT

### PROPOSED WORK

**Ala., Montgomery** — HANGARS, etc. — Con. Q.M. four 110 x 240 ft. hangars, barracks building. Noted July 3.

**Ala., Tuscaloosa**—HOSPITAL—Treas. Dpt. at office Sup. Archt., U. S. Veterans Hospital, Birmingham-Tuscaloosa Hy., near here.

**Conn., New London**—PIERS—Spec. 6282—Yards & Docks, Navy Dpt., 4 timber piers, incl. dismantling piping and electrical services.

**Ill., Chicago**—DREDGING—U. S. Eng., 77,000 cu.yd. Calumet River.

**Ill., Great Lake**—REVETMENT—U. S. Eng. Office, Custom House, St. Louis, Mo., 6,000 lin.ft. bank revetment in Mississippi River.

**Ill., Rock Island**—LEVEE—U. S. Eng. 320,000 cu.yd. levee enlargement in Marion Co. Drainage Dist., Mo.

**Ind., Lafayette**—POST OFFICE—Treas. Dpt. at office Sup. Archt., returned unopened bids to have been received Aug. 22, post office. Will readvertise. Noted July 31.

**Ky., Louisville**—DRILLING VENTS—U. S. Eng., drilling vents in lock walls, auxiliary Lock 41, Ohio River.

**La., New Orleans**—REVETMENT—U. S. Eng., 18,560 lin.ft. wooden revetment on levees in Barataria and Lake Borgne Levee Dist.

**La., New Orleans** — SOUTHERN YELLOW PINE — U. S. Eng., 141,250 ft. B.M. and 52,500 ft. southern yellow pine lumber, Flood Control, Mississippi River.

**La., Shreveport**—POST OFFICE—Treas. Dpt. at office Sup. Archt., surveys post office addition.

**Md., Baltimore**—DREDGING—U. S. Eng., in Baltimore Harbor and channels.

**Mich., Detroit**—POST OFFICE—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by R. O. Derrick, Inc., Union Trust Bldg., post office, court rooms, custom office, federal offices, Fort and Shelby Sts.

**N. Y., Canandaigua**—HOSPITAL—Vet. Bu. hospital.

**N. Y., New York**—RIP RAP—U. S. Eng., 8,500 ft. rip rap jetty, at Rockland Point at entrance to Jamaica Bay.

**O., Fairport**—BREAKWATER—U. S. Eng., Buffalo, N. Y. 4,000 lin.ft. rubble stone for breakwater.

**Ore., Portland**—JETTY REPAIR—U. S. Eng., repairing 5,400 ft. and extending 300 ft. jetty at entrance to Tillamook Bay.

**Pennsylvania**—FISH CULTURE STATION—Bur. Fisheries, G. C. Leach, in charge plans by G. A. Schneider, c/o owner, 1½ story, 30 x 32 ft. fish culture station and substation, timber.

**Pa., Erie** — POST OFFICE — Treas. Dpt. at office Sup. Archt., 1 story, basement post office. J. A. Wetmore, acting superv. archt. Noted June 19.

**Pa., Phila.** — PIER — Spec. 6281 — Yards & Docks, Navy Dpt., removing crib section pier, constructing new pier.

**Pa., Phila.**—RIP RAP—U. S. Eng., 22,000 tons rip rap stone at lower end Edgemoor Dike, Delaware River.

**Tenn., Memphis**—GRADER DERRICK BOAT—U. S. Eng., 1 steel hull grader derrick boat.

**Tenn., Memphis**—PILE DRIVER—U. S. Eng., 2 steel hull pile driver.

**Tex., Brownsville**—REMODELING—Con. Q.M., Fort Brown, remodeling buildings, new heating units, ventilating and refrigerating.

**Tex., Galveston**—REDREDGING—U. S. Eng., 112,600 cu.yd. channel at entrance to Dickenson Bayou.

**Tex., Lubbock**—POST OFFICE—Treas. Dpt. at office Sup. Archt., post office.

**Tex., Randolph Field** — SEWAGE DISPOSAL PLANT—Con. Q.M. revised plans sewage disposal plant, at Randolph Flying Field.

**Va., Quantico** — BARRACK — Spec. 6230 — Yards & Docks, Navy Dpt., four 3 story barrack buildings.

**Wash., Seattle** — DREDGING — U. S. Eng., South and West Passes Stillaquamish River.

### BIDS ASKED

**Ariz., San Luis**—INSPECTION STATION—Sept. 29, by Treas. Dpt., Arlington Bldg., inspection station.

**Calif., Nicolaus**—LEVEE—Sept. 23, by U. S. Eng. Office, California Fruit Bldg., Sacramento, 8,700 ft. levee on left bank Feather River, 3 mi. from here.

**Calif., San Francisco**—CONCRETE LANDINGS—Sept. 18, by Superintendent Lighthouses, grading, rock excav., concrete landings, concrete stairways, rein.-con. retaining walls, roadways, concrete rainshed, installing pipe lines, water tanks, hoisting derricks, etc.; adv. E. N.-R. Sept. 4.

**Colorado**—ROAD—Sept. 9, by Bureau P. Rds., Custom House, Denver, grading 10,865 mi. Project 1-C (Fall River-West Side) Fall River National Park Hy., Larimer Co., A. E. Palen, Custom House, Denver, acting engr.

**Fla., Pensacola** — BOILERS — Spec. 6185 — Sept. 10, by Yards & Docks, Navy Dpt., boilers, oil burners, and flue.

**La., Alexandria**—GARAGE—Oct. 7, by Vet. Bu., Garage 15, incl. paving, grading.

**Mass., Framingham**—POST OFFICE—Sept. 18, by Treas. Dpt. at office Sup. Archt., post office.

**Mass., Malden**—POST OFFICE—Sept. 18, by Treas. Dpt. at office Sup. Archt., 1 story, basement post office.

**Mich., Saginaw**—POST OFFICE—Sept. 15, by Treas. Dpt., at office Super. Archt., post office.

**Mo., Excelsior Springs**—QUARTERS—Sept. 23, by Vet. Bu., complete officers duplex quarters Building 23 and 24.

**N. Y., Brooklyn**—WIRE—Sept. 16, by Signal Supply Officer, Signal Sect., New York General Depot, 58th and 1st Ave., wire.

**N. Y., Brooklyn**—CONDUIT—Sept. 23, by Signal Supply Officer, Signal Sect., New York General Depot, 58th St. and 1st Ave., 2 and 4 way vitr. clay conduit.

**R. I., Melville**—GENERATOR SET—Spec. 5715—Sept. 10, by Yards & Docks, Navy Dpt., removing, reinstalling 3 generator sets, furnishing 4 boilers with set oil pumping units. Noted Aug. 21.

**Wyoming**—ROADS—Sept. 9, by Bureau P. Rds. Custom House, Denver, Colo., grading 7,222 mi. Project DE and part A-1 Granite Creek-Shell National Forest Development Rd., Bighorn Co. A. E. Palen, Denver, act. dist. engr.

**Wyoming**—GENERATOR, etc.—Sept. 23, by Dpt. Interior, Bur. Reclamation, Denver, Colo., one 5,000 kva. alternating current generator, 3 or four 1,667 kva. 2300-19100/3300 Y-volt transformers, 1 switchboard and auxiliary apparatus for Shoshone Power Plant, Shoshone Project. P. W. Dent, acting comr.; adv. E. N.-R. Sept. 4.

### CONTRACTS AWARDED

**Calif., Riverside**—HOSPITAL—Con. Q.M., March Field, 2 story, basement, 95 x 167 ft. hospital, to Los Angeles Contg. Co., 4816 West Pico St., Los Angeles, $187,000. Noted July 31.

**Ga., Fort Benning** — DISPENSARY — Con. Q.M., 2 story, 38 x 90 ft. rein.-con., brick, limestone dispensary, to Batson-Cook Co., West Point, Ga., $52,300.

**Ga., Savannah**—REMODELING—Treas. Dpt. at office Sup. Archt., remodeling, extending U. S. Post Office at Court House to J. M. Geary Co., Asheville, N. C., $508,154; elevators, to Otis Elevator Co., 810 18th St., Wash., D. C., $20,571. Noted Aug. 26.

**Md., Annapolis**—BRIDGE—Spec. 6231—Yards & Docks, bascule bridge at Naval Academy, to American Bascule Bridge Corp., Pensacola, Fla., $19,249. Noted July 24.

**Md., Baltimore**—DREDGING—U. S. Eng., 1,174,341 cu.yd. in Baltimore Harbor, to Arundel Corp., Pier 2, Pratt St., $176,151. Noted July 10.

**Mass., Bedford**—HEATING—Vet. Bu., heating, plumbing for U. S. Veteran's Hospital, to J. H. Larkin, 206 Corey Rd., Boston; electrical work, to R. A. Phelps, Beloit, Wis. Noted Apr. 24.

**N. J., Bordentown**—DREDGING—U. S. Eng., Phila., Pa., 937,000 cu.yd. Delaware River, to Atlantic, Gulf & Pacific Co., 13 Park Row, New York. Noted July 3.

**N. J., Somerset Hills**—HOSPITAL—Vet. Bu., U. S. Veteran's Hospital, to General Contg. Co., 133 East Front St., Trenton, $991,376. Noted July 17.

**N. Y., Beacon**—ROAD—Vet. Bu., entrance road at U. S. Veteran's Hospital, Castle Point, to Fleming & Sheppard Co., Inc., 116 Broad St., New York, $29,300.

**N. Y., Fort Wadsworth** (mail Staten Island)—BARRACKS—Con. Q.M., Whitehall St., New York, 3 story, basement, 80 x 400 ft. infantry

**Federal Government (Continued)**
battlion barracks, utilities, to R. J. Murphy, 55 West 42nd St., New York, $314,600. Noted July 17.

**N. C., Fort Bragg**—QUARTERS—Con. Q.M., 54 officers quarters, to York Constr. Co., Raleigh, $525,000. Noted July 31.

**N. C., Wilmington**—DREDGING—U. S. Eng., dredging 363,000 cu.yd. and 5,568,975 cu.yd. in Sect. 3, Intracoastal Waterway from Beaufort to Cape Fear River, to Arundel Corp., Pier 2, Pratt St., Baltimore, Md., $337,240 and $334,139 respectively. Noted July 17.

**Pa., Pittsburgh**—DERRICK BOAT—U. S. Eng. Office, 15 ton steel whirler derrick boat, to Dravo Contg. Co., Neville Island, $35,480. Noted July 10.

**Va., Alexandria**—POST OFFICE—Treas. Dpt. at office Sup. Archt., post office, to Beaman-Coleman Co., Raleigh, N. C., $250,000. Noted Aug. 28.

**Va., Roanoke**—ELEVATOR—Treas. Dpt. at office Sup. Archt., elevator, to Shepard Elevator Co., Cincinnati, O., $28,715. Noted July 31.

**Va., Roanoke**—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Worsham Bros., Empire Bldg., Knoxville, Tenn., $423,294. Noted July 31.

**W. Va., Parkersburg**—POST OFFICE—Treas. Dpt. at office Sup., Archt., post office, to J. L. Barnes, Logansport, Ind., $217,500. Noted July 17.

## RAILWAYS

### PROPOSED WORK

**California**—City of Stockton rail facilities in connection with Stockton Deep Water Project and a line to Rough and Ready Island, in Stockton. $350,000. L. Payton, city engr.

**Texas**—Fort Worth & Denver Northern Ry., subsidiary of Chicago, Burlington & Quincy R.R., A. W. Newton, ch. engr., Chicago, Ill., standard gage railway line from Childress to Pampa. $800,000.

### CONTRACTS AWARDED

**Illinois**—Chicago, Burlington & Quincy R.R. Co., 547 Jackson Blvd., Chicago, A. W. Newton, ch. engr., electric cinder plant in railroad yards at Galesburg, to Roberts & Schaefer Co., 400 North Michigan Ave., Chicago.

**Nebraska**—Union Pacific R.R. Co., H. C. Mann, ch. engr., 1416 Dodge St., Omaha, electric cinder plant, in Hastings, to Roberts & Schaefer, 400 North Michigan Ave., Chicago, Ill.

**Wyoming** — Union Pacific R.R. Co., H. C. Mann, ch. engr., 15th and Dodge Sts., Omaha, Neb., grading, bridging, track laying in yards at Cheyenne, to Utah Constr. Co., Ogden, Utah, $1,886,000. Est. $1,750,000. Noted July 17.

## SUBWAYS

### CONTRACTS AWARDED

**Ariz., Tucson**—City, subway, to R. H. Martin, Tucson, $149,996. Est. $330,000.

**N. Y., New York**—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., Worth Street Connection, Sect. 3, Route 101, to Hart & Early, Inc., 18 East 44th St., $337,000. Noted Aug. 14.

## GRADE CROSSINGS

### PROPOSED WORK

**Okla., Clinton**—State Hy. Dpt., Oklahoma City, preliminary plans 3 span, 86 ft. rein.-con. underpass under Frisco R.R., Custer Co. $35,000. A. R. Losh, hy. engr.

**Pa., Swissvale**—Baltimore & Ohio R.R. Co., Baltimore, Md., H. A. Lane, ch. engr., Carnegie Steel Co., C. R. Miller, purch. agt., Carnegie Bldg., Pittsburgh, Boro of Swissvale, Boro Bldg., H. D. Caldwell, secy., and Boro of Rankin, Boro Bldg., J. Miller, secy. underpass, 8 ft. square, at Keating Station. $30,000.

### BIDS ASKED

**Ont., Windsor**—Sept. 9, by C. V. Waters, city clk., general contract, structural steel mechanical and electrical equipment subway under Canadian Natl. Ry. at Wyandotte St. $100,000. M. C. McMordie, King Bldg., engr.

### CONTRACTS AWARDED

**Tex., Amarillo**—City and Santa Fe Ry., subsidiary Atchison, Topeka, & Santa Fe Ry., W. W. Kelly, Amarillo, ch. engr. Western Lines, constructing 140 ft. earth and concrete underpass, 24 ft., on Park St., to McCall Eng. Co., Waco, $40,000.

## DAMS

### PROPOSED WORK

**Texas**—Emery, Peck & Rockwood Development Co., 208 South La Salle St., Chicago, Ill., 2 power dams, 1 at Old Hamilton site, 6 mi. above Kingsland for generating power, and other several miles above at Bluffton on Colorado River to create reservoir about 40 mi. long. $2,500,000. It is planned to have all legal phases cleared up soon and start work soon after. Fargo Eng., Co., **Jackson, Mich., engrs. Noted Feb. 13.**

### CONTRACTS AWARDED

**Ark., Siloam Springs**—Illinois Water Development Co., dam across the Illinois River at Forest Park, to Southwest L. R. Meyers Co., Dallas, Tex., $68,300; dikes and rip rap, auxiliary spillway for dam, to Winstead & Gunter, Siloam Springs, $33,625.

## PIERS AND WHARVES

### CONTRACTS AWARDED

**Ont., Midland**—WHARF—N. Desjardins, secy. Dpt. P. Wks., Ottawa, extending wharf, to Rayner Constr. Co., Ltd., 159 Bay St., Toronto, $56,152. Noted July 17.

## AIRPORTS

### PROPOSED WORK

**Calif., Dana Point**—E. W. Calder, Wilshire Bldg., Los Angeles, plans by S. H. Woodruff, Wilshire Bldg., Los Angeles, hangar, administration building, school, dormitory, Spanish type. $75,000.

**Tex., Beaumont**—City, c/o F. Bertschler, park supt., airport improvements, incl. grading entire field, constructing administration building, steel hangar, beacon lights, etc. $75,000. Noted Jan. 2.

### CONTRACTS AWARDED

**Conn., South Meriden**—Meriden Aircraft Corp., Meriden, 1 story, 60 x 70 ft., steel hangar at Meriden Airport, to Whittredge Portable Hangar Co., Lynn, Mass.

## GRAIN ELEVATORS

### PROPOSED WORK

**Man., St. Boniface** — GRAIN ELEVATOR — Assiniboine Grain Co. grain elevator. $100,000.

### CONTRACTS AWARDED

**Ont., Kingston**—GRAIN ELEVATOR—H. I. Price Securities, Ltd., 80 King St. W., Toronto, 4,000,000 bu. grain elevator at Cataraqui Bay, to Barnett & McQueen, Ltd., Port Arthur.

## POWER AND LIGHTING

### PROPOSED WORK

**Ariz., Florence**—Ornamental lighting system on 5th, Main and Butte Sts. D. C. Scott, Ellis, Bldg., Phoenix, engr.

### BIDS ASKED

**Ill., Chicago** — Sept. 9, by M. J. Kennedy, comr. Gas & Electricity, City Hall, 1,000 c.p. each standards and aluminum bracket fixtures for maintenance street lighting system.

**Md., Chestertown**—Sept. 9, by State Roads Comn., G. C. Uhl, chn., Baltimore, electrical work necessary for power line, lighting system for bridge over Chester River; adv. E. N.-R. Sept. 4.

**Mass., Boston**—Sept. 9, by Traffic Comn., 154 Berkley St., furnishing, installing automatic traffic control signals. $25,000 or more.

## SPORTS AND PARKS

### PROPOSED WORK

**Ok'a., Bartlesville**—City, c/o W. N. Trautman, park supt., soon takes bids 70 x 150 ft., 2,000 seating capacity rein.-con. grandstand, dressing rooms, showers. $30,000. J. E. McCormick, city engr. Wood & Witten, 246 Lynch Bldg., Tulsa, engrs.

**Okla., McAlester**—G. H. Newton, preliminary plans swimming pool. $25,000. Private plans.

### BIDS ASKED

**Mass., Boston** — Sept. 4, by Park Dpt., 33 Beacon St., shelters on playgrounds and parks throughout city, $25,000; concrete walks at Horatio Park, Roxbury, grading and seats at Noyes Playground, East Boston, $25,000.

### CONTRACTS AWARDED

**Calif., Santa Cruz**—Interstate Recreation Corp., Phelan Bldg., San Francisco, 2 story, rein.-con. swimming pool, bowling alleys, to C. N. Swensen, 47 West Santa Clara St., San Jose, $161,507.

**N. Y., Babylon**—Long Island State Park Comn., Administration Headquarters, Belmont Lake State Park, bath house, swimming pool, administration building at Jones Beach State Park, to R. J. Murphy Co., 55 West 42nd St., New York, $621,000. Noted July 31.

## HEATING AND VENTILATING

### BIDS ASKED

**N. J., Kearny** (sta. Arlington)—Sept. 11, by Bd. Freeholders Hudson Co., Court House, Jersey City, new boiler, oil burning equipment, at Police Headquarters, Newark Turnpike. $5,000 or more. F. J. Radigan, Court House, Jersey City, co. engr.

### CONTRACTS AWARDED

**Mass., Cambridge**—Harvard University, electrical work in dormitory Unit, 3, Boylston St. and Memorial Dr., to Hixon Electric Co., 22 Elkins St., Boston; plumbing, to J. A. Cotter Co., 334 Shawmut Ave., Boston; heating and ventilating, to J. S. Cassedy, 133 Austin St., Cambridge. Est. exceeds $25,000 each. Noted Mar. 8 under "Schools."

**Mass., East Boston** (sta. Boston) — City of Boston, Dpt. P. Buildings, plumbing, sprinklers in court house, Meridian St., to F. D. Kirby & Co., 230 Boylston St.; electrical work, to Staunton Electric Co., 18A T Wharf. Est. $25,000. Noted June 12 under "Public Buildings."

**Mass., Medford** (br. Boston)—City of Medford, School Building Comn., heating in Forest St. High School, to R. A. LaCentra & Co., 57 Washington St., Boston; plumbing to A. F. Curtin & Sons, 42 High St., Medford; electrical work, to Kenworthy & Taylor, 407 Bway, Everett. Est. $25,000. Noted July 31 under "Schools."

**N. J., Elizabeth**—Bd. Educ., 417 South Broad St., heating for School, Shelley Ave., to Shur & Okum, 225 North Wood Ave., Linden, $36,920; electrical work, to Dengler Liddy Burd Electric Co., 314 Morris Ave., $17,591. Noted Aug. 21 under "Schools."

**N. J., Freehold**—Bd. Freeholders Monmouth Co., heating and ventilating for new court house, to W. F. Conklin, Long Branch, $49,689. Noted Aug. 7 under "Public."

## UNCLASSIFIED

### PROPOSED WORK

**Ind., Evansville** — TERMINAL — E. Mead Johnson Co., St. Joseph Ave., preliminary plans concrete, steel river and rail terminal. $300,000. M. J. Hoffman Constr. Co., 500 Furniture Bldg., engrs.

**Mass., Beverly**—TANKS—Gulf Refining Co., Park Sq. Bldg., Boston, 3 concrete, steel tanks, concrete retaining wall, concrete found., Water St. Private plans.

**Oklahoma**—GAS PIPE LINE—State Fuel Supply Co., Anadarko, preliminary plans 30 mi. 4 in. natural gas system from Cement to Carnegie. $40,000. Private plans.

**Tex., Amarillo**—CRUSHED ROCK PLANT—Riverside Sand, Gravel & Crushed Stone Co., c/o W. L. Slayden, Amarillo, sand, gravel and crushed rock plant, 35 car daily output. $40,000. Private plans. Also wants quotations on furnishing 50 to 60 ton locomotive, and 1 to 1½ yd. drag line.

### BIDS ASKED

**N. Y., New York** — BOOK CONVEYORS — Sept. 9, by Park Bd., W. R. Herrick, pres., Park Dpt., Arsenal Bldg., installing 2 book conveyors in main reading room, New York Public Library, 42nd St. and 5th Ave.

**Tex., Jasper**—FISH HATCHERY—Sept. 10, by Texas Game, Fish & Oyster Comn., c/o **W. J. Tucker, Jasper**, fish hatchery, near here, incl. 30 acres in ponds, 55,000 cu.yd. earth excav., 3,500 cu.yd. overhauling, 2,250 lin.ft. 6 in. and 900 ft. 8- to 30-in. pipe. $125,000. J. Marks, Jasper, engr. Noted July 24.

### CONTRACTS AWARDED

**Colo., Rye**—FISH HATCHERY—State Game & Fish Dpt., c/o R. G. Parvin, Denver, fish hatchery and retaining ponds, to R. Lindemeier Ft. Collins. Est. $25,000.

**Mass., Haverhill**—CAR HOUSE—Eastern Massachusetts Street Ry. Co., 38 Chauncy St., Boston, reconstructing 1 story, brick, steel, concrete, to Morris Constr. Co., 92 Gates St., Lowell. Est. $25,000. Noted July 17.

**Mass., Salem**—GREENHOUSE—W. I. Walker, 141 Loring Ave., 1 story, 50 x 100 ft., steel, brick, glass greenhouse, office, concrete found., to Lord & Burnham Co., 80 Boylston St., Boston. Est. $25,000.

**N. J., Bound Brook**—RADIO BROADCASTING PLANT—C. MacKenzie, archt., 119 Broad St., New York, 2 story, basement, brick, broadcasting plant addition, 1 story, cooling plant, 1 story garage, tennis courts, to Skinner & Cook, 60 East 42nd St., New York, for Radio Corp. of America, Woolworth Bldg., 233 Bway., New York. Est. $40,000 or more. Noted Aug. 21.

**Tenn., Memphis**—TANKS—Standard Oil Co. of Louisiana, 1211 Union St., addition to storage plant at Wisconsin Ave. and Riverside, incl. 3 large steel tanks. $100,000. Owner builds.

## MATERIALS

### BIDS ASKED

WATER TUBING—**Glendale, Calif.**—Sept. 11, by City Council, 35,000 ft. ¾ in., 10,000 ft. 1 in., 1,000 ft. 2 in. coiled or straight lengthened annealed copper water tubing, 35,000 ft ¾ in., 10,000 ft. 1 in., 1,000 ft. 2 in. straight lengthened quarter hard temper copper water tubing.

CULVERT PIPE, etc.—**Jacksonville, Fla.**—Sept. 10, by Bd. Comrs. Duval Co., H. J. Redavats, chn., 10,000 lin.ft. 12, 18 and 24 in. corrugated, galvanized metal culvert pipe, 60,000 ft. long leaf, merchantable grade, fine grain, yellow pine lumber, dressed on four sides, delivered at Duval Co. Prison Farm.

PILING—**Chicago, Ill.**—Sept. 9, by City, City Hall, 244 tons steel sheet piling. R. W. Wolfe, comr. Bd. P. Wks.

LIME—**Oklahoma City, Okla.**—Sept. 9, by M. Peshek, city clk., 1,500 tons quick lime, 1,100 tons hydrated lime for filtration plant. $30,000. G. F. Brown, Petro Bldg., Oklahoma City, engr.

HYDRATED LIME, etc.—**Providence, R. I.**—Sept. 8, at office City Clerk, City Hall., furnishing 160 tons hydrated lime, 380 tons sulphate of alumini to Dpt. P. Wks., for Bd. Contr. & Supply, J. E. Dunne, engr.

*Constr. News page 97*

**Materials (Continued)**

### CONTRACTS AWARDED

PIPE—**Glendale, Calif.**—City, to Natl. Cast Iron Pipe Co., 417 South Hill St., Los Angeles, 15,000 ft. 6 in. Class 250 c.i. pipe, 18 ft. lengths at $0.668 per ft., 15,000 ft. 8 in. $0.989, 5,000 ft. 12 in. $1,805; to Pacific States Cast Iron Pipe Co., Los Angeles, 5,000 ft. 6 in. at $0.65 per ft.

STONE—**Long Beach, Calif.**—Furnishing from 0 to 30,000 tons maintenance stone for Rainbow Pier during period from date of contract to June 1, 1931, to Hauser Constr. Co., Security Bldg., Long Beach, at $1.60 per ton.

BRIDGE MATERIAL—**Fairfield, Ia.**—Jefferson Co., 143,100 m.b.m. floor bridge plank, 5,667 m.b.m. pressure treated plank, 4,000 ft. treated piling, to Carter-Waters Corp., 213 Old Colony Bldg., Des Moines, $1,967 and to Morris Lumber Co., Eugene, Ore., $5,136. Noted **Aug. 7.**

## EQUIPMENT

### PROPOSED WORK

STONE QUARRY—**Waco, Tex.**—W. Mathney & C. Williams, Waco, stone quarry on 500 acre site, installing quarry plant, necessary equipment for quarrying the stone.

### BIDS ASKED

TRANSFORMERS—**Los Angeles, Calif.**—Sept. 17, by T. Oughton, city purch. agt., three 3333 kva. transformers under Spec. 2158.

LOCOMOTIVES—**Chicago, Ill.**—Sept. 16, by City, City Hall, 3 complete storage battery locomotives with 3 extra storage batteries for use in Chicago Ave. Tunnel. R. W. Wolfe, comr., P. Wks.

LATHE and MACHINE—**Chicago, Ill.**—Sept. 8, by City, Hall, 18 in. x 14 ft. heavy duty, motor driven, geared head, quick change engine, lathe, one motor driven No. 2 Universal Milling Machine, accessories, at William Hale Thompson Pumping Station, 49th St. and Western Ave. R. W. Wolfe, comr. P. Wks.

TRACTOR—**Hastings, Minn.**—Sept. 15, by J. M. Langenfeld, aud. Dakota Co. one crawler type tractor.

TRACTOR—**Dallas, Tex.**—Sept. 15, by Dallas Co., c/o C. E. Gross, aud., 10 ton caterpillar type tractor for Dist. 2.

STOKERS—**Salt Lake City, Utah**—Sept. 8, Bd. Educ., c/o G. King, clk., one 700 lb. and one 1,200 lb. per hr. underfeed type stokers. H. Barker, City-County Bldg., engr.

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# Buildings

## RESIDENTIAL

### BIDS ASKED

**Calif., San Francisco** — See "Contracts Awarded."

**Ill., Chicago**—A. W. Swayne, archt., 10 South La Salle St., taking bids 22 story, 100 x 106 ft., rein.-con., brick, 418-24 Belmont Ave., for A. W. Swayne, 520 North Michigan Ave. $2,000,000.

**Ill., Chicago**—R. G. Ackley, 1447 East 63rd St. and 5132 Hyde Park Blvd. and T. R. Bishop & Son, archts., 35 South Dearborn St., taking bids 3 story, 105 x 189 ft., rein.-con., brick, stone, 6311-19 Blackstone Ave. $375,000.

**Ill., Chicago** — H. K. Holsman, archt., 307 North Michigan Ave., taking bids 17 story, basement, 50 x 150 ft., rein.-con., brick, stone, 5810 Blackstone Ave., for Syndicate, c/o architect.

**N. J., Elizabeth**—See "Contracts Awarded."

**N. Y., New York**—See "Contracts Awarded."

**Pa., Phila.**—See "Contracts Awarded."

### CONTRACTS AWARDED

**Calif., Los Angeles**—E. A. Kassing, c/o F. W. Green, archt., 1612 Cosmo St., 7 story, 87 x 166 ft., rein.-con., steel, sheet metal, incl. garage, 1745 North Gramercy St., to A. J. Showalter 1358 North Harper St., $200,000.

**Calif., Los Angeles**—R. E. Fennell, 7 story, basement, 60 x 125 ft., rein.-con., Mariposa Ave., to Mischell Constr. Co., Architects Bldg., $275,000.

**Calif., Los Angeles**—J. Braunstein., 8 story, basement, rein.-con., San Marino and Serrano Sts., to Far West Constr. Co., 315 West 9th St., $385,000.

**Calif., Oakland**—R. E. Mayer, 1129 McKinley St., 3 story, basement, frame, stucco, also concrete garage, Crescent Ave. near Santa Clara Ave. $150,000. Owner builds.

**Calif., San Francisco**—W. R. Voorhies, 369 Pine St., 3 story, basement, steel, concrete, Pacific Ave. near Baker St., day labor. $150,000.

**Ind., Knox**—J. Tomassi, 2 story, basement, 100 x 125 ft., brick, steel hotel, resort, Bass Lake. Est. $150,000. Owner builds.

**N. J., Elizabeth**—E. Simon, 810 Murray St., 5 story, basement, brick, steel, plain found., Murray St., separate contracts. $250,000. Private plans.

**N. Y., New York**—Havermyer Co., 15 story, 100 x 150 ft., 5th Ave. and 66th St., to Hegeman-Harris Co., 360 Madison Ave.

**N. Y., New York**—Forty West 86th Street Corp., c/o S. Barken & Son, 42 West 48th St. W., 18 story, 75 x 82 ft., 40-44 West 86th St., separate contracts. $800,000. Taking bids now. J. M. Felson, 250 West 57th St., archt.

**O., Cleveland** — Woodview Realty Co., 801 Swetland Bldg., 3 story, basement, 45 x 118 ft., brick, 2260 Noble Rd., to Dolin Constr. Co., 801 Swetland Bldg. Est. $150,000.

**Pa., Phila.**—Owner, c/o Arnold H. Mueller, archt., 901 Walnut St., 6 story, basement, 80 x 105 ft., rein.-con., brick, steel, plain found., Cedar St. and Washington Lane, separate contracts. Est. $300,000.

**Wis., Milwaukee** — Monroe Realty Co., c/o R. B. Williamson, archt., 405 Bway., 3 story, basement, 116 x 140 ft. apartment, garage, Green Bay, to W. W. Olflein, Inc., East Wisconsin St.

## CLUBS

### PROPOSED WORK

**Calif., San Francisco**—Olympic Club, Olympic Club Bldg., plans by Blackwell, Brown & Bauer, 251 Kearny St., 26 story, basement, steel, concrete annex, Post and Mason Sts. $2,000,000.

**Conn., Manchester**—Manchester Y. M. C. A., S. E. Simon, pres., plans by Y. M. C. A. Architectural Bureau, additions to Y. M. C. A., incl. library, recreation hall, bowling facilities, natatorium. $150,000 or more.

**Conn., New Haven**—Quinnipeak Club, A. S. Brooks, chn., Building Com., c/o Southern New England Telephone Co., 157 Church St., taking bids 5 story, basement, 65 x 125 ft., brick, stone, Church St. To exceed $150,000. D. Orr, 956 Chapel St., archt.

**Ind., South Bend**—Park Bd. plans by E. W Young, South Bend, brick, steel club house at Erskine. $150,000.

**N. J., Hackensack**—Women Club of Hackensack, 359 Union St., revised sketches by W. Bessel, 58 West 49th St., New York, remodeling and constructing 3 story, basement addition, 359 Union St. $150,000.

**N. J., Perth Amboy**—E. Wierzbicki, archt., 175 Smith St., soon lets contract 3 story, basement, brick, steel, Elm St., for Fourth Ward Polish Citizens Club, c/o architect. Noted Aug. 14.

**N. J., Plainfield**—Steuben Society of America (Muhlenberg Unit) plans club house and hall. $150,000. Architect not selected.

**N. Y., Rochester**—Y. W. C. A., 190 Franklin St., plans by Gordon & Kaelber, 311 Alexander Ct., Central Building, Alexander St. near East Adams St. $1,000,000.

**O., Bellaire**—Bellaire Aerie Eagles lodge building, incl. stores, offices, Union St. $150,000. Architect not selected.

**Tenn., Knoxville**—Elks Club, Main St., plans by Bauman & Baumman, Knoxville, and soon takes bids 4 story, basement, 160 x 160 ft., rein.-con., brick, steel, plain found., Gay St. and Hill Ave. $300,000.

### BIDS ASKED

**N. J., Hackensack**—W. S. Bessell, archt., 58 West 49th St., New York, taking bids general contract altering and constructing 1 story, basement, brick, steel club and auditorium addition, Union St., for Women's Club of Hackensack, 359 Union St. $150,000. Noted July 3.

**N. J., Perth Amboy**—E. Wierzbicke, archt., 175 Smith St., bids about Oct. 1, general contract 3 story, basement, brick, steel, Elm St., for Fourth Ward Polish Citizens Club, c/o architect. Noted Aug. 14.

### CONTRACTS AWARDED

**N. J., Camden** — City Athletic Club, P. H. Harding, pres., Wilson Bldg., 8 story, basement, mezzanine, 75 x 302 ft., brick, rein.-con., Cooper St. and Bridge Blvd., to G. W. Shaner & Son, Palmyra.

**Ill., Alton**—Alton Y. W. C. A., F. Senn, genl. secy., 3 story, basement, rein.-con., brick, to McCarthy Bros., 4908 Delmar Blvd., St. Louis, Mo., $153,738.

## HOSPITALS

### PROPOSED WORK

**Ind., Indianapolis** — City Hospital bids in December, 3 story, rein.-con., brick ward units, 960 Locke St. $170,000. Vonnegut-Bohn & Mueller, 610 Indiana Trust Bldg., archt.

**Minn., St. Paul**—St. Luke's Hospital, Sherman St., rejected bids 4 story, basement hospital addition. $150,000. Will readvertise. Noted June 30 Daily.

**O., Ravenna**—Portage Co. hospital, near here. $250,000. **Maturity in spring.**

**Tex., El Paso**—City and El Paso Co. plans by Trost & Trost, Two Republics Bldg., brick, stone, concrete hospital. $400,000 bond election soon for same. Noted Aug. 7.

**Utah, Provo**—State Building Comn., Capitol, Salt Lake City, soon takes bids 3 story mental hospital. $250,000. J. Nelson, Provo, archt. Noted July 14, 1929.

### BIDS ASKED

**Ind., Evansville** — Oct. 1, by Bd. Comrs. Vanderburgh Co., infirmary, incl. 2 new steam boilers, brick stack, power plant, brick, steel. $150,000.

**N. Y., Kings Park**—Sept. 17, by Dpt. Mental Hygiene, State Office Bldg., Albany, reception building, employees building, kitchen and dining room building and altering and constructing additions to Building 2, at Kings Park State Hospital.

### CONTRACTS AWARDED

**Mass., Malden** (br. Boston)—Kendall, Taylor & Co., archts., 209 Columbus Ave., Boston, concrete and plain foundation for hospital group, Hospital Rd., to L. W. Oakes, Inc., 100 Halleck St., Boston, for Malden Hospital, E. P. Bliss, chn. comn. Noted Aug. 21.

**Mo., Independence**—Independence Sanitarium, 5 story, basement, 80 x 135 ft., brick, rein.-con. sanitarium to Lyle Weeks, 633 South Fuller St. Est. $150,000. Noted July 31 under "Contracts Awarded."

**N. J., Jersey City**—Bd. City Comrs., City Hall, general contract altering and constructing 3 story, basement addition to Isolation Hospital, to W. Robertson & Son, 15 Exchange Pl., $39,000; plumbing, to W. W. Farriel Co., 44 Montgomery St., $11,597; heating ,to F. P. Farrell, 269 Camden St., Newark, $29,778; electrical work, to Hoffman & Elias, 59 West 51st St., New York, $19,570. Grand total $99,945. Noted Aug. 4 Daily.

## CHURCHES

### PROPOSED WORK

**Mass., Brockton**—Greek Orthodox Church, E. Triantafilidies, pastor, 57 Spring St., sketches by C. T. Olson, 21 High St., 1 story ,basement, brick, stone, church, plain found. $150,000.

**Mass., Cambridge**—Lutheran Synod of N. Y. and N. E., J. Goehring, pastor, 7 Buckingham Pl., chapel, Dunster and Winthrop Sts. $150,000. J. L. Conant, 20 Oxford St., consult. archt. Architect not selected. Noted Feb. 28, 1929.

**N. J., Dunellen**—Holy Innocents Episcopal Church, C. A. Conover, pastor, 334 4th St., sketches 2 story, basement, brick, parish hall. $150,000.

### BIDS ASKED

**Ill., Oak Park**—J. W. McCarthy & Co., archts., 139 North Clark St., Chicago, bids about Sept. 20, brick, stone church, Austin Blvd., for Catholic Bishop of Chicago, 719 Rush St., Chicago. $150,000.

**Mass., Cambridge** — St. Peters Episcopal Church, F. C. Lawrence, pastor 15 Clinton St., taking bids 3 story, basement, brick, stone parish house, plain found., 834 Massachusetts Ave. $150,000. C. C. Cogswell, 6 Beacon St., Boston, archt.

**Mass., Springfield**—Union Congregational Church, J. B. Lewis, pastor, 42 Parkwood St., taking bids 1 story, basement, brick, stone church, parish house, Pine St. $150,000. R. B. Warner, 129 Ingersoll Dr., archt. Noted June 19.

**N. J., Arlington**—Myers & Shanley, archts., 24 Walnut St., Newark, bids about Nov. 1, general contract 2 story, basement, brick, steel seminary, for Immaculate Conception Seminary, c/o architect. Noted Aug. 14.

**N. J., Caldwell**—Sept. 4, by N. Hulme, archt., 1524 Chestnut St., Phila., Pa., general contract Sunday School and fellowship hall, for Methodist Episcopal Church, c/o architect. $150,000.

**N. J., Jersey City**—J. Armstrong, archt., 36 Gautier Ave., bids about Oct. 1, general contract 3 story, basement, 50 x 100 ft., brick, steel, Atlantic St., for Monumental Baptist Church, 18 Atlantic St. Est. $150,000. Noted July 31.

### CONTRACTS AWARDED

**N. J., Harrison**—J. W. Baker, archt., 111 North 4th St., general contract 3 story, basement, brick, steel rectory, to A. Lorenz P. Haase, 40 Ivy St., Newark, for Our Lady of Chenstohowa Roman Catholic Church, J. F. Szpilman, 18 South 3rd St. $150,000. Noted July 24. Plumbing and heating, to J. E. Joyce, 84 South 6th St., Newark; electrical work, to Reynolds Electric Co., 751 Bway., Newark.

**N. J., Jersey City**—Fanning & Shaw, archts., 49 Ward St., Paterson, general contract 2 story, basement, 50 x 115 ft., brick, steel, to H. Montague & Son, Inc., 15 Exchange Pl., for Church of Christ the King, J. Shovlin, pastor. Noted Aug. 14.

## SCHOOLS

### PROPOSED WORK

**Calif., Pasadena**—California School of Technology plans by Goodhue & Associates, 2 West 47th St., New York, 2 story, concrete, steel laboratory, rein.-con. astrophysics laboratory. $800,000.

**Conn., Waterbury**—City, Town Plot Dist. Bd. Educ., brick, steel addition to Tinker School. $150,000. Architect not selected.

**Ia., Ft. Dodge**—Bd. Educ., E. Peterson, secy., revised plans by E. O. Damon, East Mason Blk., and F. Griffith, Snell Blk., Junior High School, 2 story, basement, rein.-con., brick, stone, $225,000. Former bids rejected. Noted Aug. 14.

**Mass., Haverhill**—M. and J. Bloomfield, Merrimac St., sketches by C. V. Badger, 54 Merrimac St., 2 story, basement, brick academy of music, plain found., Merrimac St. $150,000 or more. Noted Jan. 10, 1929 under "Buildings-Commercial."

**N. J., Elizabeth**—Bd. Educ., 417 South Broad St., sketches by H. B. Brady, Inc., 333 North

Schools (Continued)

Broad St., 2 story, basement, brick, steel, rein.-con., Clarkson Ave., $250,000; 3 story, basement, South Broad St., $150,000. Noted July 31.

**N. J., Elizabeth**—Bd. Educ., 417 South Broad St., sketches by H. B. Brady, Inc., 333 North Broad St., Boys Vocational School, 3 story, basement, brick, steel, rein.-con. $500,000. Noted Aug. 8.

**N. J., Sayreville**—Bd. Educ., Boro Hall, 2 story, basement, brick, steel, plain found. $150,000. Architect not selected.

**N. J., Union City**—Holy Name Roman Catholic Church, J. N. Grieff, pastor, c/o F. J. Ricker, archt., 685 Hudson Ave., West New York, 3 story, basement, 70 x 150 ft., brick, steel addition, plain found., 32nd and Central Ave. $250,000.

**O., Cleveland**—Bd. Educ., F. G. Hogen, dir., plans by G. M. Hopkinson, Auditorium Garage Bldg., 3 story, basement, brick, steel, concrete high school, East 74th St. and Canton Ave. $900,000.

**O., Cleveland**—Bd. Educ., F. G. Hogen, dir., plans by J. M. Hopkinson, Auditorium Garage Bldg., 3 story, basement, 224 x 416 ft., brick, steel, concrete high school, West 140th St. and Lakota Ave. $800,000.

**O., Cuyahoga Falls**—Town plans by M. E. Harpster, Akron, 2 story, brick, steel Eastside. $150,000.

**Pa., Haverford**—Haverford School, c/o E. M. Wilson, plans by W. P. Barney, 1805 Walnut St., Phila., 2 story, basement, 53 x 128 ft., steel, stone, athletic building, plain found.

**Pa., McKeesport**—Bd. Educ., J. B. Richey, supt., Ariel Bldg., plans by Schwab, Palmgreen & Merrick, Koppers Bldg., Pittsburgh, Eleventh Ward School, 28th St. $180,000. Noted Mar. 20.

**Pa., Phila.** — Girard College sketches by Thomas, Martin & Kirkpatrick, 220 South 16th St., chapel, College Ave. and Corinthian St. $200,000.

### BIDS ASKED

**Conn., West Hartford** (br. Hartford)—City. School Bd., taking bids Junior High School, 2 story, basement, 195 x 290 ft., brick, steel, Park Rd. $350,000. R. F. Barker, 15 Lewis St., Hartford, archt. Noted Aug. 28.

**Ill., Quincy**—Bd. Educ., W. E. White, secy., Musselman Bldg., bids about Oct. 1, rein.-con., brick, stone school incl. gymnasium, swimming pool, machine shop, kitchen, 14th St. between Main and Jersey Sts. $1,300,000 J. D. Chubb, 109 North Dearborn St., Chicago, and Behrensmeyer and Haffner, Western Catholic Union Bldg., archts.

**Ind., Bloomington** — Sept. 15, by School Comrs., brick, steel limestone, East 2nd St. $150,000. A. Grindle, Bloomington, archt.

**La., New Orleans** — Sept. 25, by Orleans School Bd., Girls High School, 3 story, rein.-con., brick, stucco, Claigorne St. $500,000. E. A. Christy, New Orleans, archt. Noted Aug. 7.

**Mass., Ayer**—Town, H. Priest, taking bids 3 story, basement, 65 x 125 ft., brick, stone high school, incl. gymnasium, plain found., Main St. $150,000. R. H. Doane, 60 Batterymarch St., Boston, archt. Noted Aug. 15.

**Mass., Cambridge**—Sept. 5, by Coolidge, Shepley, Bulfinch & Abbott, archts., 122 Ames Bldg., Boston, 3½ story, brick, granite, limestone Kirkland House, dormitory and Masters House addition, for Harvard University, Harvard Sq. $150,000.

**Mass., Lee**—Town, C. Miller, supt. Schools, taking bids 2 story, basement, brick, stone high school, plain found. To exceed $150,000. M. W. Malone, 23 Pearl St., Springfield, archt. Noted July 24.

**Mass., South Hadley**—Sept. 8, by Town, School Comn., M. Graham, secy., two 2 story, basement, brick schools, plain founds., one at Hadley and Ferry Sts., other at Granby Rd., $150,000 or more. M. J. Maloney, 23 Pearl St., Springfield, archt. Noted July 24.

**Me., Lewiston**—City, Superintendent Schools, taking bids 3 story, basement, 135 x 280 ft., brick, stone, granite high school, plain found., Central and Campus Aves. $300,000. Coombs & Harriman, 11 Lisbon St., archts. Noted Jan. 23.

**Mich., Detroit**—Malcolmson, Higginbotham & Trout, archts., 1217 Griswold St., taking bids 4 story, basement, 150 x 200 ft., rein.-con., brick, steel high school, 3 story faculty building and 1 story power plant, plain founds., Cambridge St., for University of Detroit, 6 Mile Rd. and Livernois Ave. $650,000.

• **Mass., Medford** (br. Boston)—Sept. 9, by Schoolhouse Building Com., 2 story, basement, brick, stone, plain found., Plaestead and Roberts Rds. $175,000-$250,000. Hutchins & French, 11 Beacon Sts., Boston, archts. Noted Aug. 15.

**Mich., New Buffalo**—Sept. 9, by F. W. Wolff, secy. Bd. Educ., 2 story, basement, 75 x 155 ft., brick, rein.-con., steel, stone, plain found. $150,000. Warren S. Holmes Co., Lansing, archts.

**Mo., Ferguson**—Bd. Educ. bids about Sept. 16, general contract (1st unit) 2 story, basement, 74 x 112 ft., brick, rein.-con. high school. W. B. Ittner, Inc., Continental Life Bldg., St. Louis, archts. Noted Aug. 28.

**Mo., Jefferson City**—Sept. 10, by Lincoln University, State College for Negros, I. C. Tull, bus. mgr., 2 story, basement, 63 x 99 ft. home economics building, 2 and 4 story, basement, 80 x 200 ft. educational building. $250,000. W. B. Ittner, Inc., Continental Life Bldg., St. Louis, archt. Noted Feb. 20.

**Mo., St. Louis** — St. Louis University, R. Johnston, pres., Grand and West Pine Sts., bids about Sept. 24, contract School of Commerce and Finance, 4 story, 135 x 213 ft., rein.-con., brick, stone, Lindell Blvd. $250,000. H. P. Hess, 1001 Ambassador Bldg., archt. Noted June 26.

**N. J., Hillside** (sta. Elizabeth)—Bd. Educ., H. W. Doremus, pres., Twp. Hall, bids about Oct. 1, general contract 2 story, basement, brick, steel, plain found., Leslie St. and Winans Ave. $165,000. J. Wind, Jr., 1450 North Broad St., archt. Noted Aug. 7.

**N. J., New Brunswick**—Bd. Educ., Livingston Ave., bids about Oct. 15, 2 story, basement addition to Senior High School, Livingston Ave. $150,000. A. Merchant, 1 Elm Row, New Brunswick, archt. Noted Aug. 28.

**N. J., Plainfield** — J. S. Pigott, archt., 42 Walnut St., Newark, bids about Oct. 1, general contract 2 story, basement school, Liberty St., for St. Mary's Roman Catholic Church, P. A. Maher, pastor, 516 West 6th St. Est. $300,000. Noted July 31.

**N. J., Perth Amboy**—Bd. Educ., 261 State St., bids about Oct. 1, general contract, altering and constructing, 3 story, basement, brick, steel, rein.-con. addition, plain found., Madison Ave. $150,000. Greisen & Tuzig, 175 Smith St., archts.

**N. Y., Tuxedo Park**—Bd. Educ. taking bids on revised plans 3 story, basement, brick, steel high and grade school. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted July 24.

**Pa., Kennett Square**—Sept. 8, by F. W. Groff, pres. Bd. Educ., Junior and Senior High School, 2 story, basement, 213 x 408 ft., rein.-con., brick, steel, plain found. E. W. Martin, DuPont Bldg., Wilmington, Del., archt.

**Pa., Sheffield**—Sept. 8, by School Bd., C. C. Lenning, secy., Harding High School, Aliquippa, brick school. $155,000. Carlisle & Sharrer, Martin Bldg., N. S. Pittsburgh, archt.

**Tex., San Antonio**—Sept. 10, by Bd. Educ., Lavaca and Water Sts., and Adams & Adams, archts., Real Bldg., 3 story, tower, brick, stone, tile, rein.-con. high school, incl. gymnasium, 2,000 seating capacity auditorium, 80,000 sq.ft. floor space, plain found., Spanish Acres. $1,000,000. Noted July 17.

### CONTRACTS AWARDED

**Calif., Berkeley**—School Dist., brick, steel addition to Longfellow School, to C. D. Vezey & Son, 3220 Sacramento St., Oakland, $123,385. Noted July 24.

**Calif., San Jose**—State Teachers College, general contract rein.-con. gymnasium, to H. L. Petersen, 731 Treat Ave., San Francisco, $114,836; plumbing, heating, electrical work and ventilating, to Latourette-Fical Co., 907 Front St., Sacramento, $35,772. Noted Feb. 13.

**Calif., Santa Ana**—Santa Ana School Dist., general contract Willard High School, 2 story, rein.-con., to C. W. Pettifer, 1427 California St., Long Beach, $228,570. Noted Aug. 28.

**Colo., Colorado Springs**—Bd. Trustees Colorado College, c/o E. P. Shove, general contract chapel building, to P. Rogers, Inc., Pueblo; pipe organ, to Welte-Tripp Co., Sound Beach, Conn.; sheet metal work, to Lowell-Meservey Hardware Co., Colorado Springs; heating and ventilating, to McCarthy & Co., Colorado Springs. Est. $250,000.

**Ill., Joliet**—Burnham Bros., Inc., archts., 160 North La Salle St., Chicago, general contract 3 story and 4 story gymnasium, addition to Joliet Township High School, to Hansen-Peterson Co., Joliet. $500,000. Noted June 26.

**Ind., Mentone**—Bd. School Comrs. general contract brick, steel, consolidated high school, to F. E. Peck, Topeka. Est. $150,000. Noted Aug. 7.

**Mass., Cambridge**—Harvard University, unit 5, 4 story, basement, irregular sized, brick, limestone, steel dormitory, plain found., to Sawyer Constr. Co., Park Sq. Bldg., Boston, est. $2,000,000; electrical work, to E. C. Lewis, Inc., 121 Federal St., Boston, $25,000 or more; heating and plumbing, to J. S. Cassedy, 133 Austin St., Cambridge, est. exceeds $25,000. Noted Aug. 21.

**Mass., Lowell**—Notre Dame Roman Catholic Church, c/o W. F. Fontaine, archt., 285 Main St., Woonsocket, R. I., 2 story, basement, brick, stone, plain found., Smith Ave. and Middlesex St., to L. Marion, 12 Martin St. Est. $150,000-$160,000. Noted June 19.

**Mass., Westfield**—Town, Boy's Trade School, 2 story, basement, brick, steel trade school, to Philips Constr. Co., 10 Main St., $90,244. Noted Aug. 14.

**Mass., West Quincy** (mail Braintree) — St. Mary's Parish, c/o W. B. Colleary, archt., 30 Boylston St., Boston, 2 story, basement, brick, stone school, plain found., to Chas. Louge Building Co., 18 Tremont St., Boston. Est. $150,000. Noted Aug. 14.

**Mo., St. Joseph** — Bd. Educ., A. L. Loving, secy., 10th and Felix Sts., general contract Central High School, 2 and 3 story, basement, 264 x 377 ft., rein.-con., brick, stone, steel, incl. gymnasium, auditorium, 26th and Edmond Sts., to Lehr Constr. Co., 2115 Frederick St., $499,850; heating, plumbing, to Industrial Plumbing Co., 103 South 4th St., $136,400.

**N. J., Englishtown** — Bd. Educ., Manalopin Twp., general contract 2 story, basement, brick, steel, to F. Arnold, Bunkerhoff Ave., Freehold. Est. $150,000. Noted Aug. 7.

**N. J., Keansburg** — V. J. Eck, archt., 12 Broad Ave., Red Bank, general contract 2 story, basement, Carr Ave., to Perth Amboy Constr. Co., 61 Madison Ave., for St. Anne's Roman Catholic School. Est. $150,000. Noted Aug. 28.

**N. J., Orange**—Bd. Educ., High School, general contract 2 basement, 160 x 195 ft. brick, steel, to F. and C. Haerter, 765 Dewey Ave., West New York, $199,000; plumbing, to Jaehnig & Peoples, Inc., 221 13th Ave., Newark, $18,000; heating, to J. H. Cooney, Inc., 210 North 4th St., Harrison, $48,574; electrical work, to Buhl & Coffrey, 35 Hudson St., Newark, $27,773. Grand total $293,347. Noted Aug. 7.

**N. J., Ridgewood**—Bd. Educ., West Franklin Ave., general contract 2 and 3 story, basement, brick, steel addition, plain found., to Hayunga & Thomas, 83 North 13th St., Prospect Park, Paterson, $357,686; heating, to J. A. Faber Plumbing Co., 237 Diamond Bridge Ave., Hawthorne, $74,980; plumbing, to Standard Plumbing & Heating Co., 181 Ellison St., Paterson, $21,732; electrical work to Busch Bros., 101 West Palisade Ave., Englewood, $33,740; Grand total $488,138. Noted July 24.

**N. J., Spotswood**—Bd. Educ., Boro Hall, general contract altering and constructing 2 story, basement, brick, steel addition, to J. Cheek, Jr., Sayreville. Est. $150,000.

**N. Y., Buffalo** — St. John Kanty Church, Swinbourne St., masonry work and fireproofing for school, to A. Wizzinski, $81,600; structural steel, to Tobol Iron Wks., Miller Ave. and New York Central R.R., $28,200; steel joist, to Kalman Steel Co., Lake Ave., Blasdell, $6,385; waterproofing, to Western New York Par-lock Applier, Inc., Ellicott Sq., $895. Grand total $117,080. Noted July 10.

**N. C., Raleigh**—State School for Negro Blind & Deaf Institute, brick, tile administration building, 4 dormitories, to J. P. Rogers, Smithfield, $158,000; heating, to Piedmont Plumbing & Heating Co., Gastonia, $26,194. Noted July 4, 1929 under "buildings." Sewerage system, to R. E. Sholes, Raleigh.

**O., Bowling Green** — State Building Comn., Columbus, brick, steel, concrete recitation and departmental building, to Watts-Suhrbier Co., 1235 Miami St., Toledo. Est. $300,000. Noted Aug. 7. Steam heating, to Bryce Heating & Ventilating Co., Spitzer Bldg., Toledo.

**O., Oxford**—A. T. Connar, dir. Dpt. P. Wks., 9th and Oak Sts., Columbus, 2 story, basement, 120 x 167 ft., brick, concrete, steel chemistry building, at Miami University, to J. Wespiper, Oxford, for Bd. Trustees Miami University, $74,678. Noted Aug. 14.

**Pa., Beaver Falls**—Geneva College 1 story, 85 x 115 ft., Briar Hill stone, Indiana limestone, Collegiate Gothic design library, to Cook-Anderson Co., Beaver. Est. $150,000.

**Pa., Pottstown**—Hill School, J. I. Wendell, headmaster, 2 story, basement, 78 x 181 ft. and 107 x 148 ft. gymnasium and power house, brick, steel, limestone, plain found., to F. H. Keiser, 138 East 4th St.

**Tenn., Johnson City**—State Bd. Educ., Nashville, general contract 2 story, basement, mezzanine, brick, stone, rein.-con., steel library and addition to girls dormitory, to Rogers & Loventhal, Chattanooga, $183,979. Noted Aug. 21.

**Utah, Bingham**—Jordan School Dist., Sandy, 3 story, basement, 100 x 250 ft., brick, concrete high school, plain found., to P. Paulson, Salt Lake City, $256,800; heating and plumbing, to H. G. Burton, Salt Lake City, $53,100. Noted June 19. Electrical work, to Blaine Gray Electric Shop, $16,448.

## THEATRES

### PROPOSED WORK

**Ariz., Phoenix**—Fox West Coast Theatres Co., Los Angeles, Calif., sketches by S. C. Lee, 714 West 10th St., Los Angeles, theatre, 2,500 seating capacity, City Hall Plaza. $450,000.

**Calif., Eureka**—G. Mann (Redwood Theatres, Inc.) c/o N. R. Coulter, 46 Kearny St., San Francisco, 2,000 seating capacity, Class A—rein.-con., steel. $500,000.

**Okla., Duncan**—G. G. Antene, 105 West 24th St., Oklahoma City, plans by Layton, Hicks & Forsythe, Braniff Bldg., Oklahoma City, 5 story, basement, 75 x 140 ft., rein.-con., brick theatre and office building, plain found., Main St. $150,000.

### BIDS ASKED

**Ia., Davenport**—Sept. 15, by Third and Brady Streets Corp., c/o G. M. Bechtel, dir. and United Realties Co., lessee, 9 story, basement, rein.-con. steel, incl. hotel, on 150 x 192 ft. site, 3rd and Brady Sts. $1,500,000 upwards. A. S. Graven, Inc., 100 North La Salle, St., Chicago, Ill., archts. Noted June 26.

**O., Steubenville**—Sept. 8, by A. S. Graven Inc., archts., 100 North La Salle St., Chicago, Ill., 2 story, brick, steel movie and office, for Floto Heirs, estate, Steubenville. $150,000. Noted Aug. 15.

**Pa., Reading**—Sept. 6, by W. H. Lee, archt., 1505 Race St., 1 story, balcony, basement, 120 x 250 ft., rein.-con., brick, steel, 723-35 Penn St., for Wilmer & Vincent, c/o A. Egan, 1451 Bway.

### CONTRACTS AWARDED

**Calif., Santa Barbara** — Banks, Huntley Co., rein.-con. to Beller Constr. Co., 6513 Hollywood Blvd., Los Angeles, $200,000.

## BANKS

### BIDS ASKED

**Vt., Burlington**—Sept. 6 (extended date), by Chittendon County Trust Co., E. J. Booth, pres., 114 Church St., and Harper & West, archts., 92 State St., Boston, Mass., 2 story, basement, brick, marble, concrete, steel bank, College St. $200,000.

**Ill., Chicago**—Sept. 8, by Zimmerman, Saxe & Zimmerman, 430 North Michigan Ave., 2 story, brick, stone, 1951 Milwaukee Ave., for Second Security Bank, 1951 Milwaukee Ave. $150,000. Noted June 5.

*Constr. News page [illegible]*

Banks (Continued)

**Mass., Lynn**—Equitable Co-operative Bank, F. W. Nixon, pres., 145 Munroe St., bids about Sept. 10, 2 story, basement, brick, concrete, steel, plain found., Willow and Oxford Sts. $150,000 or more. T. M. James Co., 3 Park St., Boston, archts. Noted July 24.

**Vt., Burlington**—Sept. 6, by Chittendon County Trust Co., E. J. Booth, pres., 114 Church St., 2 story, marble bank and trust building, College St. $200,000. Harper & West, 92 State St., Boston, Mass., archts. Noted Aug. 28.

## OFFICES

### PROPOSED WORK

**Ill., Chicago**—W. J. Rayburn, et al., 38 South Dearborn St., plans by Quinn & Christinsen, 363 North Michigan Ave., 5 story, basement, 48 x 165 ft., rein.-con., brick, incl. stores, Cicero Ave. and Madison St. $300,000.

**N. J., Newark**—Majestic Radio Sales Co., 259 Madison Ave., Perth Amboy, sketches by W. E. Lehman, 972 Broad St., 2 story, basement, 40 x 250 ft., brick, steel, incl. showrooms, warehouse, Frelinghuysen Ave. $150,000.

**N. J., Perth Amboy**—M. Peterson, Gordon and Kearny Aves., sketches 2 story, basement, brick, steel, incl. stores, plain found., Smith St. $150,000. Private plans.

**N. Y., New York**—S. Silver, c/o J. Unger, archt., 93 Main St., Flushing, 38 story, 100 x 105 ft. office, 42nd St. and 2nd Ave. $4,500,000.

**Pa., Pittsburgh**—M. Nirdlinger, Empire Bldg., soon lets contract 5 story, basement, 160 x 160 ft., brick, stone professional building, incl. garage, 5th and Atwood Sts., for E. L. Bartley, Morrowfield Apartments.

### BIDS ASKED

**N. J., Hackensack**—Owner, c/o P. J. Jossier, archt., 240 Broad Ave., Palisades Park, bids about Oct. 15, general or separate contracts 2 story, basement, 60 x 120 ft., brick, steel, incl. showroom, Main St. $150,000. Noted Aug. 21.

### CONTRACTS AWARDED

**Ill., Chicago**—L. Greenblatt, c/o S. M. Eichberg, archt., 64 West Randolph St., general contract 4 story, 48 x 100 ft., Bedford stone, incl. stores, Milwaukee and Ashland Aves., to Mutual Constr. Co., 2532 Warren Ave., $350,000.

**O., Cleveland**—See "Buildings—Unclassified."

**Que., Montreal**—Guaranteed Pure Milk Co., Ltd., St. Catherine St. W., 122 x 134 ft. office, Aqueduct St., to Concrete Constr. Co., Ltd., 1082 Decarie Blvd., $200,000.

## STORES

### PROPOSED WORK

**Mass., Andover**—Sept. 6, by W. J. Burns, Main St., 2 story, basement, brick, cast stone, incl. offices, Main St. $150,000. P. F. Gilbert, 53 Central St., Lowell, archt.

**N. J., Perth Amboy**—F. Gold & H. S. Rothenberg, c/o Greisen & Turik, archts., 175 Smith St., 2 story, basement, brick, steel, incl. apartment, 83 Smith St. $150,000.

### BIDS ASKED

**N. J., Jersey City**—M. A. Wolfe, archt., 845 Broad St., Newark, bids about Sept. 15, general or separate contracts 3 story, basement, brick, steel, incl. apartments, Manhattan and Terrace Aves., for A. Cordano, c/o architect. $150,000. Noted Aug. 14.

**N. J., Lyndhurst**—P. J. Jossier, archt., 240 Broad Ave., Palisades Park, bids about Oct. 1, general or separate contracts 2 story, basement, 90 x 100 ft., brick, steel, incl. apartment, for Owner, c/o architect. $150,000. Noted Aug 21.

### CONTRACTS AWARDED

**N. J., Newark**—Myers & Shanley, archts., 24 Walnut St., general contract 1 story, basement, brick, steel addition, to C. McCann, 21 Ludlow St., for W. W. Oppenheim, Inc., 657 Broad St. Est. $150,000. F. W. Woolworth Co., 661 Broad St., lessee. Noted Aug. 8.

**Vt., Burlington**—T. W. Parkhill, 480 South Willard St., 2 story, basement, 60 x 120 ft., brick, incl. office, Main and South Winooski Sts., to J. E. Cashman, 77 College St. Est. $150,000.

## PUBLIC

### PROPOSED WORK

**Ariz., Bisbee**—COURT HOUSE—**Cochise Co.**, c/o W. E. Clark, clk., sketches **by R. Place**, Tucson, court house and jail. $300,000. Noted Mar. 19 Daily.

**Conn., Hartford**—POLICE HEADQUARTERS and STATION—City, W. E. Batterson, mayor, brick, steel, stone. Est. exceeds $150,000. Architect not selected.

**Conn., Stamford** — ALMS HOUSE — City, Municipal Bldg., sketches by Coffin & Coffin, 522 5th Ave., New York, brick. $150,000.

**Mass., Stoneham**—LIBRARY—TOWN, R. H. Richardson, Town Hall, plans by Coolidge & Carlson, 89 State St., Boston, altering and constructing 2 story, basement, brick, limestone addition, plain found., Main St. $150,000.

**N. J., Bayonne** — FIRE HOUSE — Bd. City Comrs., City Hall, plans by L. Quien, 229 Broad St., Elizabeth, 2 story, basement, brick, steel, plain found. $150,000.

**Tex., Corpus Christi** — COURT HOUSE — Nueces Co., c/o N. Benton, judge, plans by Dielmann & Levy, State Natl. Bank Bldg., altering and constructing 5 story brick, clay tile, rein.-con. annex. $100,000 to $150,000.

*Constr. News page* 100

### BIDS ASKED

**Calif., Ventura**—COURTHOUSE and JAIL—Bd. Supervs. Ventura Co. taking bids 3 story, 62 x 118 ft., court house annex, 3 story, 42 x 118 ft. jail, rein.-con. tile, marble, terra cotta. $275,000. H. Burket, El Jardin Patio, archt.

**Ind., Gary** — COMMUNITY HOUSE — Union Espanol, taking bids brick, steel, stucco, 11th and Van Buren Sts. $150,000. J. H. Wildermoth, 583 Bway., archt.

**Mass., Boston**—LIBRARY—Sept. 16, by City, Library Dpt., 2 story, basement, brick, limestone, plain found., 1497 Tremont St. $150,000. Cram & Ferguson, 248 Boylston St., archts.

**Mass., Needham** — POLICE and FIRE STATION — Sept. 22, by Bd. Selectmen, 2 story, basement, brick, concrete, steel, plain found., School and Chestnut Sts., for Town. $150,000. G. E. Robinson, 80 Federal St., Boston, archts. Noted Aug. 28.

**Mass., Winchester**—LIBRARY—Sept. 4, by Town, R. T. Hale, chn. Building Com., 1 story, basement, stone, plain found., Mystic Valley Parkway and Washington St. $175,000. Kilham, Hopkins & Greeley, 9 Park St., Boston, archts.

**Mass., Woburn**—CITY HALL, COURT HOUSE and POLICE STATION—City, P. J. Gallagher, mayor, bids about Sept. 15 to 20, brick, steel stone building. To exceed $150,000. M. A. Dyer Co., 1 Beacon St., Boston, archts. Noted July 24.

**N. J., Bayonne** — LIBRARY — Bayonne Free Public Library, Avenue C, bids about Oct. 1, general contract 2 story, basement, 160 x 160 ft. addition, Avenue C. $150,000. C. Shilowitz, 26 Journal Sq., Jersey City, archt. Noted July 31.

**N. J., Hillsdale**—COTTAGES—Sept. 8, by C. N. Leathem, Jr., archt., State Office Bldg., Trenton, 4 cottages at state hospital for Dpt. Institutions & Agencies, Trenton. $150,000.

**N. J., Holmdell**—COTTAGES, etc.—Sept. 16, by C. N. Leathem, Jr., archt., State Office Bldg., Trenton, 4 doctors cottages, barn, for New Jersey State Hospital, for Dpt. Institutions & Agencies, Trenton. $150,000.

### CONTRACTS AWARDED

**Ala., Birmingham** — ALMSHOUSE—Jefferson Co. Bd. Revenue, W. D. Bishop, chn., fourteen 1 and 2 story, 40 x 80, 20 x 40 ft., brick, concrete, steel buildings at Ketona, near here, to Day & Sachs, 2400 5th Ave. S., $197,900. Noted June 26.

**Ark., DeQueen**—COURT HOUSE and JAIL—Sevier Co., c/o J. C. Arnold, judge, 4 story, basement, 72 x 75 ft., concrete, brick, stone, to Hardy Bros., Texarkana; jail equipment to Southern Prison Co., 4500 South Presa St., San Antonio, Tex.

**Ill., Highland Park**—LIBRARY—Holmes & Flynn, archts., 8 South Dearborn St., Chicago, general contract 1 story, basement, 100 x 105 ft., Wisconsin Lannon, and Indiana Bedford stone, to E. I. Archibald Co., 111 West Washington St., Chicago; plumbing, to T. H. Decker, Highland Park; heating, to Murphy & Schwall, Highland Park; electric wiring, to Vetter Electric Co., Highland Park. Est. $100,000. Noted July 3.

**Mass., Lynn**—POLICE STATION, etc.—City, Superintendent Buildings, general contract brick, steel, incl. garage, boiler house, to E. C. Blanchard, 333 Union St., $91,560. Noted Aug. 7.

**O., London** — DORMITORY — A. T. Connar, supt. Dpt. P. Wks., 9th and Oak Sts., Columbus, 64 x 71 ft. and 71 x 614 ft., concrete, steel at Prison Farm, to E. Elford & Son, 555 South Front St., Columbus, $330,000. Noted July 31.

## BUILDINGS—UNCLASSIFIED

### PROPOSED WORK

**Mich., Ypsilanti** — UNION — Alumni Assn., Michigan State Normal College, plans by F. Eurich, 2537 Woodward Bldg., Detroit, 2 story, basement, 130 x 200 ft., brick, steel, stone, concrete, plain found. $300,000.

**N. J., Plainfield**—EXCHANGE—New Jersey Bell Telephone Co., 132 West 2nd St., sketches by Voorhees, Gmelin & Walker, 101 Park Ave., New York, brick, steel, central office building, Park Ave. and West 5th St. $150,000.

### BIDS ASKED

**Calif., Los Angeles**—LABORATORY—Brunswig Drug Co., 501 North Main St., bids about Sept. 22, 5 story, basement, 100 x 155 ft. concrete, brick, steel, 2nd St. A. C. Martin, Higgins Bldg., archt. Steel contract awarded to McClintic-Marshall Co., Pacific Southwest Bldg.

**Mass., North Reading**—EMPLOYEES—Sept. 11, by Commonwealth of Massachusetts, Dpt. P. Health, 3 story, basement, brick, stone male employees building at State Sanatorium, plain found. $150,000. Stevens & Lee, 45 Newbury St., Boston, archts. Noted Apr. 17.

**Mass., Boston**—Commonwealth of Massachusetts, Dpt. P. Wks., dredging in area adjacent to Bethlehem Shipbuilding Corp., Simpson Works, East Boston, to Bay State Dredging & Contg. Co., 62 Condor St., East Boston, $25,320. Noted Aug. 14.

**Pa., Uniontown**—ARCADE—P. P. Long, 161 South Beeson Ave., taking bids 1 and 2 story, 30 x 124 ft., brick, hollow tile rear addition to Gallatin Gardins, incl. stores, apartments, roof garden, Gallatin Ave. $150,000. J. Harmon, Fayette Title & Trust Bldg., Uniontown, archt.

### CONTRACTS AWARDED

**Conn., Torrington** — EXCHANGE — Southern New England Telephone Co., 157 Church St., New Haven, 2 story, basement, 100 x 100 ft., brick, steel, marble, to Larkin-Carey Co., 166 Brewery St., New Haven. Est. $200,000. Noted Aug. 21.

**Ga., Columbus**—NEWSPAPER—P. W. Page Corp., c/o W. E. Page, pres., 1 story, basement, 120 x 150 ft., brick, rein.-con., steel, plain found., 12th St., to Williams Lumber Co., Columbus, $156,000.

**Ia., Cedar Rapids**—EXCHANGE—Northwestern Bell Telephone Co., c/o M. H. Morris, 318 South 2nd St., superstructure, 3 story basement 97 x 103 ft. concrete, with stone, steel, to T. Stark & Co., 118 South 11th St. Est. $250,000. Noted Aug. 14.

**Mass., Boston**—HOME—Home for Destitute Catholic Children, 786 Harrison Ave., altering and constructing 4 story, basement, brick, steel addition, plain found., Harrison Ave., to F. S. Brennan Co., 40 Court St. Est. $150,000.

**Mass., Lawrence**—RAILROAD STATION—Boston & Maine R.R., W. J. Backes, ch. engr., Boston, brick, steel, to H. Wales Lines Co., 134 State St., Meriden, Conn. Est. $375,000. Noted Aug. 21.

**Mich., Big Rapids**—EXCHANGE—Michigan Bell Telephone Co., 1365 Cass Ave., Detroit, general contract brick, steel, rein.-con., plain found., to DeRight Bros. Constr. Co., Kalamazoo. Est. $200,000. Noted Aug. 21.

**O., Cleveland**—ANIMAL HOSPITAL—Western Reserve University, S. S. Wilson, secy., 109409 East Euclid Ave., 4 story, basement, 40 x 90 ft., brick, steel, concrete, Cummington Rd., to Lundoff-Bicknell Co., B. F. Keith Bldg. Est. $150,000.

**O., Cleveland**—COMMERCIAL and OFFICE—Acme Realty Corp., D. F. Crawford, secy., 1507 Central Natl. Bank Bldg., 8 story, basement, 64 x 115 ft., brick, steel, terra cotta, rein.-con., East 9th St. and Chester Ave., to Aronberg-Fried Co., Terminal Tower. Est. $300,000.

**Pa., Phila.**—EXCHANGE—J. T. Windrim, archt., Commonwealth Bldg., 3 story, basement, 146 x 150 ft., rein.-con., brick, steel, to Irwin & Leighton, 1505 Race St., for Bell Telephone Co. of America, 1835 Arch St. Noted Aug. 21.

# Buildings

## FACTORIES AND MILLS

### PROPOSED WORK

**Calif., Los Angeles**—PLANT—Brunswig Drug Co., 501 North Main St., sketches manufacturing plant, on site bounded by Central Ave., 2nd and San Pedro Sts. To exceed $500,000. Architect not selected.

**Calif., Los Angeles** — PUBLISHING PLANT —Times-Mirror Co., 118 South Bway., sketches by G. B. Kaufman, Union Bank Bldg., 12 story basement, Class A, 2nd and Spring Sts.

**Mass., Cambridge**—POTTERY PLANT—A. H. Howes & Co., Inc., 205 Richdale Ave., rebuilding pottery plant, recently destroyed by fire, Richdale Ave. $50,000. Private plans.

**Mass., Natick**—ICE PLANT—J. A. Hill, 90 Pond St., 1 story, brick, steel, tile artificial ice plant, concrete found., West Central St. $74,000. C. Coneby Eng. & Constr. Co., 1580 Ansol Rd., Cleveland, O., engrs.

**N. J., Bound Brook**—STEEL FABRICATION FACTORY—George A. Just Co., 395 Lexington Ave., New York, brick, plain found. $40,000. Architect not selected.

**N. J., Camden**—FACTORY—Continental Car Co., c/o Francesro & Jacobus, archt., 511 5th Ave., New York, 5 or 7 story, 129 x 339 ft. factory, Arch and 2nd Sts.

**N. J., Newark**—REPAIR—Bd. Educ., City Hall Annex, 3 story, basement, brick, steel repair department building, $150,000.

**O., Cleveland** — FACTORY — Cleveland Steel Products Co., 7300 Madison Ave., plans by George S. Rider Co., Marshall Bldg., 1 story, 78 x 90 ft., brick, steel, 7300 Madison Ave. $40,000.

**O., Cleveland**—PACKING PLANT—Cleveland Provision Co., H. A. Schanz, pres.-treas., 2527 Canal Rd., 2 story, brick, rein.-con., 3378 West 65th St. $200,000. H. B. Henschein, 1637 Prairie Ave., Chicago, Ill., consult. engr.

**Okla., Chickasha**—OIL REFINERY—J. B. Nicklos, Chickasha, sketches oil refinery. $75,000. Private plans.

**Tex., Cuero** — PACKING and STORAGE PLANT—Swift & Co., Packers and Exchange Aves., Chicago, Ill., and Cuero, revised plans 2 story, 48 x 51 ft., brick, concrete. $60,000. Private plans.

**Wis., Lodi** — FACTORY — Wrought Washer Mfg. Co., 46-54 South Bay St., Milwaukee, plans by Klug & Smith Co., 69 East Wisconsin Ave., Milwaukee, 1 story, 65 x 500 ft. and 65 x 385 ft., brick, steel rolling mill and storage building.

**Ont., Hamilton**—PRINTING PLANT—Reid Press, Ltd., 25 MacNab St. S., plans by R. E. McDonnell, 570 Lister Bldg., and takes bids about Sept. 15, 1 story, basement, 169 x 230 ft., rein.-con., brick, steel, Ferguson Ave. $125,000.

**Ont., Sandwich**—PLANT—British American Oil Co., Royal Bank Bldg., Toronto, S. J. Parsons, genl. mgr., oil storage and distribution plant. $100,000. Interested in prices complate equipment.

### BIDS ASKED

**Me., Dixfield** — MANUFACTURING — Berst Foster Dixfield Co., A. Smith, mgr., 1 story, 65 x 155 ft., concrete, steel to J. H. Kerr, Prospect Ave., Rumford. Est. exceeds $40,000.

## Factories and Mills (Continued)

**Mass., Dorchester** (sta. Boston)—BAKERY and WAREHOUSE—S. Cole, 235 Blue Hill Ave., taking bids 1 story, 55 x 100 ft., brick, steel, Blue Hill Ave. $40,000. Schein & Levine, 333 Washington St., Boston, archts.

**Mass., Everett**—BAKERY—S. Piantedosi, 83 Main St., taking bids 1 story, basement, brick, steel, concrete found., Main St. $40,000-$50,000. Private plans.

**Mass., Leominster**—PLANT—Du Pont Viscoloid Co., 511 Lancaster St., taking bids Building 100, 3 story, 75 x 125 ft., brick, plain found., Lancaster St. Est. exceeds $40,000. Private plans.

**Mass., Somerville**—LAUNDRY—Sept. 6, by A. MacNaughton, archt., 131 Highland Ave., Arlington laundry, for White Cross Laundry Co.

**N. J., Newark**—FACTORY and GARAGE—R. C. Klemm, archt., 944 Broad St., bids about Sept. 15, general contract 1 and 2 story, basement, 25 x 100 ft., brick, steel, 1820-22 Oxford St., for A. Kaminski, c/o architect. Noted Aug. 14.

**N. J., Union City** — DAIRY PLANT — G. Willaredt, archt., 411 23rd St., West New York, bids about Oct. 1, general contract altering and constructing 2 story, basement, 28x155 ft. addition, New York Ave. and 45th St., for Consumers Dairy, 400 45th St. Est. $45,000. Noted Aug. 14.

**O., Youngstown**—PACKING PLANT—Swift & Co., Packers and Exchange Aves., Chicago, Ill., bids about Sept. 20, rebuilding modern packing plant, West Commerce St., recently destroyed by fire. $50,000.

**Wis., Milwaukee**—FACTORY—Filer & Stowell Co., 219 Becher St., taking bids 3 story, 70 x 81 ft., brick, steel, plain found., Becher St. Private plans.

### CONTRACTS AWARDED

**Conn., Torrington** — FACTORY — Torrington Casting Co., New Litchfield St., 1 and 2 story, brick, steel, concrete, brass casting shop, office, New Litchfield St., to Longhi Constr. Co., 42 Calhoun St., Waterbury. Est. $40,000.

**Ill., Chicago** — PLANT — Pub. Serv. Co. of Northern Illinois, 72 West Adams St., general contract 2 story, 300 x 326 ft., concrete, brick, stone, Dundee Rd. and Skokie Valley Route of North Shore Electric Co., to O. Randolph, Inc., 53 West Jackson Blvd. Est. $350,000.

**Ind., Evansville** — FACTORY—Mead-Johnson Co., general contract rein.-con., brick, South St. Joseph St., to C. Kanzler & Sons, 500 Furniture Bldg. Est. $40,000.

**Ind., Ft. Wayne**—PLANT—De Wald Tire Co., general contract 75 x 115 ft., rein.-con., brick, steel plant and service station, 510 West Jefferson St., to Rump-Kintz So., 210 Medical Arts Bldg. Est. $42,000.

**Ind., Ft. Wayne**—FACTORY—General Electric Co. 3 story, basement, brick, rein.-con., Winter St. and Wabash Ry., to Austin Co., 16112 Euclid Ave., Cleveland, O. Est. $200,000.

**Ind., Indianapolis** — FACTORY — Beach & Arthur, Inc., 221 West South St., general contract 1 story, basement, 200 x 300 ft., rein.-con., brick, steel, 2900 Columbia Ave., to H. Fitlon, 958 North Penna St. Est. $75,000.

**Ind., Indianapolis**—PLANT—Hoosier Coal & Oil Co., general contract brick, steel, 30th St. and Nickel Plate R.R., to W. C. Kelly, 5859 Forest Lake St. Est. $40,000.

**Mass., Everett** — BOTTLING PLANT — Merrimac Chemical Co., Chemical Lane, 2 story, basement, 50 x 172 ft., brick, steel, to A. C. Peters, Inc., 46 Cornhill, Boston. Est. $60,000.

**Mass., Lynn**—SHOE FACTORY—Bender Shoe Co., 95 State St., altering 5 story, brick, timber, State St., to G. Schaefer, 525 Washington St. Est. $40,000.

**Mo., Kansas City**—PLANT—Commercial Products Refining Co., 608 Brokers St., plant addition, to Bedford Constr. Co., 260 East Illinois Ave., Chicago, Ill. Est. $250,000.

**N. J., Bound Brook**—LABORATORY—F. Y. Joannes, archt., 420 Lexington Ave., New York, general contract 4 story, basement, 40 x 105 ft., brick, steel, to Wigton-Abbott Co., 552 West 23rd St., New York, for Calco Chemical Co., Bound Brook Rd. Est. $40,000. Noted July 24 Daily.

**N. J., East Rutherford** — LABORATORY — Trubek Laboratories, East Rutherford, general contract 1 story, basement, 45 x 160 ft., brick, steel, plain found., to J. J. O'Leary Co., 125 Prospect St., Passaic. Est. $40,000.

**N. J., Hoboken**—PLANT—Cornell & Underhill, 311 Spring St., New York, general contract 2 story, basement, brick, steel, 14th and Madison Sts., to Bonanno Bros., 1827 Bergen Turnpike, North Bergen. Est. $40,000 or more.

**N. J., New Brunswick**—FACTORY—Goetze Gasket & Packing Co., Allen Ave., general contract 1 story addition, to J. Goodfriend, Boorum Ave., Middletown. Est. $40,000.

**O., Massillon**—FACTORY—Corundite Refractories, Inc., 1 story, brick, factory, to house new tunnel kiln, to T. L. Pixon Co., Pittsburgh, Pa., $50,000. M. E. Lutz, Canton, will aid with construction. H. M. Robertson, engr., Builders Exch. Bldg., Cleveland, will supervise project.

**Ont., Walkerville** — FACTORY — Dominion Paint Wks. Ltd., Ottawa St. and Argyle Rd., 5 story, 60 x 100 ft., concrete, brick addition, to W. H. Yates, c/o owner, $90,000.

## GARAGES

### PROPOSED WORK

**Pa., Greenville**—Sterling Oil Co., R. S. Newton, in charge constr., Emlenton, plans by H. C. Clepper, 103 Vandergrift Bldg., Pittsburgh, 1 story, brick service station, Penn and Main Sts. $40,000.

**Pa., Wilkinsburg**—B. H. Lawson, Starr Bldg., Pittsburgh, soon lets contract 2 story, basement, 66 x 115 ft., brick, steel garage and sales building, Pennsylvania Ave. and Montier St., for H. Pittsburgh Co., 1122 Penn Ave., Pittsburgh.

### CONTRACTS AWARDED

**Calif., Los Angeles** — Southern California Edison Co., 1200 North Main St., 6 story, basement, 50 x 150 ft., steel, concrete, South Hope St., to P. J. Walker Co., Garland Bldg., $275,000.

**Calif., Oakland**—See "Buildings—Residential."

**Conn., Stamford**—See "Warehouses."

**Ind., Angelo**—See "Shops and Foundries."

**Ind., Indianapolis**—J. L. Essex, general contract brick, steel service station, Hasbrook and Shelby Sts., to W. Van Sant, 25 North Gladstone St. Est. $40,000.

**Mass., Jamaica Plain** (sta. Boston) — Shell Eastern Petroleum Products Co., 141 Milk St., Boston, concrete service station, Columbus Ave. and Center St., to L. J. Nawn, Inc., Magazine St., Roxbury.

## SHOPS AND FOUNDRIES

### PROPOSED WORK

**Okla., Boise City**—SHOPS—Atchison, Topeka & Santa Fe R.R. Co., c/o Superintendent Western Lines, Amarillo, Tex. roundhouse, mechanical shops, side tracks. W. W. Kelly, Amarillo, Tex., c/o Western Lines, ch. engr.

### CONTRACTS AWARDED

**Calif., San Francisco**—SHOPS—FACTORY—Royal Show Case Co., 759 McAllister St., 2 story, basement, concrete, McAllister St., to Spivock & Spivock, Hobart Bldg., $50,000.

**Ind., Angola**—SHOPS, etc.—Graffill-Oil Co., South Bend, general contract rein.-con., brick, steel machine shop and service station, Maumee and Martha Sts., to Williams Constr. Co., Niles, Mich. Est. $43,000.

**Pa., Pittsburgh**—MACHINE SHOP, etc.—E. B. Lee, archt., Chamber of Commerce Bldg., 1st group buildings, incl. 45 x 128 ft. machine shop, 50 x 80 ft. office, 60 x 127 ft. bath house, all brick, steel, to W. F. Trimble & Sons Co., 1719 Pennsylvania Ave., for Gulf Refining Co., Frick Building Annex. Total est. $1,500,000. Noted July 31.

## POWER PLANTS

### PROPOSED WORK

**Mass., Beverly**—Gulf Refining Co., Park Sq. Bldg., Boston, altering and constructing 1 story, brick, steel pump house addition, concrete found., Water St. $40,000 or more. Private plans.

**Mass., Waltham**—Edison Electrical Illuminating Co., 39 Boylston St., Boston, altering and constructing 1 story, brick, concrete, steel electric sub-station addition, Pine St. $50,000. Architect not selected.

**Oregon**—California-Oregon Power Co., 58 Sutter St., San Francisco, Calif., applied for 6 power sites on Klamath River. $27,600,000. R. Luper, Salem, engr.

**Texas**—See "Dams."

**Alaska, Hyder**—Portland Canal Power Co., W. T. Batcheller, pres., Dexter Horton Bldg., Seattle, Wash., hydro-electric development, incl. 800 ft. power tunnel, 400 ft. steel penstock pipe, 2 mi. reservoir will be created. $3,000,000. E. R. Wright, resident engr. in charge surveys, preliminary work.

**Que., Buckingham**—James MacLaren Co. Ltd., brick, steel power house, 425 ft. dam and intake structure connecting intake by a tunnel to power house, 8 stone gates, 24 ft. wide, 20 ft. deep, 2 waste gates, 18 ft. wide, four 28,000 hp. generators; on Licore River. $10,000,000. Private plans.

### BIDS ASKED

**Ind., Butlerville**—Sept. 20, by Feeble Minded School, steel, limestone power house, equipment. $50,000. O. B. Little, 307 North Illinois St., Indianapolis, archt.

**Ind., Evansville**—See "Hospitals."

**La., Morgan City**—See "Waterworks."

**Mass., Dighton**—Anchor Color & Gum Wks., taking bids 1 story, brick, steel power plant, plain found. $40,000 or more. E. I. Marvell, 290 Bedford St., Fall River, archt.

**Mich., Detroit**—Sept. 16, by Bd. Water Comrs., 735 Randolph St., substructure switch house, turbine house, east foundation wall of boiler house, West Warren Ave. at Detroit Terminal R.R., Dearborn. G. H. Fenkell, genl. mgr. and ch. engr.; adv. E. N.-R. Sept. 6.

**N. J., Jersey City**—Sept. 9, by Bd. City Comrs., G. V. O'Hanlon, City Hall, 3 story, basement, 40 x 65 ft., brick, steel power house addition at City Hospital, Baldwin and Montgomery Sts. $150,000. J. T. Rowland, Jr., 30 Journal Sq., archt. Noted July 17.

### CONTRACTS AWARDED

**Arizona** — American Telephone & Telegraph Co., Champa St., Denver, Colo., open wire test and repeater stations at Holbrook and at Kingman, to Mead & Mount Constr. Co., Denver Natl. Bank Bldg., Denver, Colo., $109,300.

**Colo., Paonia**—Oliver Power Co., power plant, to Phoenix Utility Constr. Co., 2 Rector St., New York. Est. $250,000. Noted May 29.

**Fla., Tallahassee**—State Bd. Control, central heating plant at Florida State College for Women, to J. M. Raymond Constr. Co., Jacksonville, $46,458.

**Ga., Macon**—Macon Gas Co., four 1 story, brick, concrete sub-stations, to Stillwell & Sons, Macon, $60,000.

**Mass., Boston**—Quincy Market Cold Storage & Warehouse Co., 178 Atlantic Ave., 70 x 77 ft., brick, steel, concrete, power house, pile and concrete found., to Aberthaw Co., 80 Federal St., Boston, $100,000.

**Mass., Cambridge**—Harvard University, A. L. Lowell, pres., 1 story, brick, steel switch house, plain found., Winthrop St., to Hegeman-Harris Co., Inc., 185 Devonshire St., Boston. Est. $40,000, incl. equipment.

**Mo., Chillicothe**—City, 1,500 kw. turbo-generator, accessories, to Elliott Co., Fairfax Bldg., Kansas City. Noted July 17.

**Mo., St. Louis**—St. Louis Refrigerating & Cold Storage Co., 1300 Lewis St., 2 story, 65 x 70 ft., rein.-con., brick refrigerating plant and sub-station, 1304 Clark Ave., to McCromack-Combs Constr. Co., Columbia Bldg. Est. $40,000.

**O., Cleveland**—Allied Oil Co., F. R. Newman, secy.-treas., 1021 Guardian Bldg., masonry contract for 1 story, 24 x 40 ft. pump house, 24 x 50 ft. boiler house, 20 x 20 ft. office building, East 40th St., to Masters & Mullen Constr. Co., Rose Bldg. Est. $40,000.

**Okla., Watts**—Illinois Development Co., Siloam Springs, Ark., hydro-electric plant on Illinois River, near here, to Southwest L. E. Myers Co., Dallas, Tex., $200,000. Est. $240,000.

**Ore., Eugene** — Water Bd., condenser for steam-electric plant, to C. H. Wheeler & Co., $23,000; brick work for boiler, to Young-Hartman, Portland, $12,366.

**Pa., Pottstown**—See "Schools."

**S. D., Pierre**—City, general contract power plant, to Gray Constr. Co., Watertown, $47,500; plumbing and heating, to Iver Stokke, Sioux Falls, $7,700; two 750 hp. engines and generators, to Commonwealth Electric Co., $84,400; switchboard, to General Electric Co., $8,700. Grand total $148,300. Noted June 27, 1929.

**Que., Beauharnois**—Beauharnois Power Corp., 2,100 tons structural steel, for power house, 1,250 tons trash racks and frames, two 200 ton power house cranes and two 150 ton gantry cranes for power house bulkhead, to Dominion Bridge Co., 1111 Beaver Hall, Montreal; 2,600 tons gate heads and guides, to Canadian Vickers Lt., Maisonneuve, Montreal; 4,000 tons rein.-con. steel to be used in building to Canadian Car & Fdry. Co. Ltd., 621 Craig St., W. Peck Rolling Mills Ltd., 63 Mili St., Canadian Tube & Steel Products, 107 Hamilton St., all in Montreal.

## WAREHOUSES

### BIDS ASKED

**Mass., Beverly**—See "Contracts Awarded."

**N. Y., Harrison**—J. E. Nitchie, archt., World Bldg., New York, taking bids general contract 2 story, basement, 110 x 200 ft., brick, steel, concrete showroom, West and Columbus Aves., for Behrer Co., c/o architect.

**Tex., Baytown**—See "Contracts Awarded."

### CONTRACTS AWARDED

**Conn., Stamford**—Stamford Gas & Electric Co., 3 story, 80 x 112 ft., rein.-con. warehouse, and 1 story, 63 x 194 ft., structural steel, brick garage, Crosby and Pacific Sts., to Turner Constr. Co., 178 Tremont St., Boston, Mass.

**Mass., Beverly** — Gulf Refining Co., 85-121 Water St., 2 story, 80 x 280 ft., brick, steel warehouse, timber pile wharf, Water St., separate contracts. $90,000. Owner taking bids on sub-contracts. Private plans.

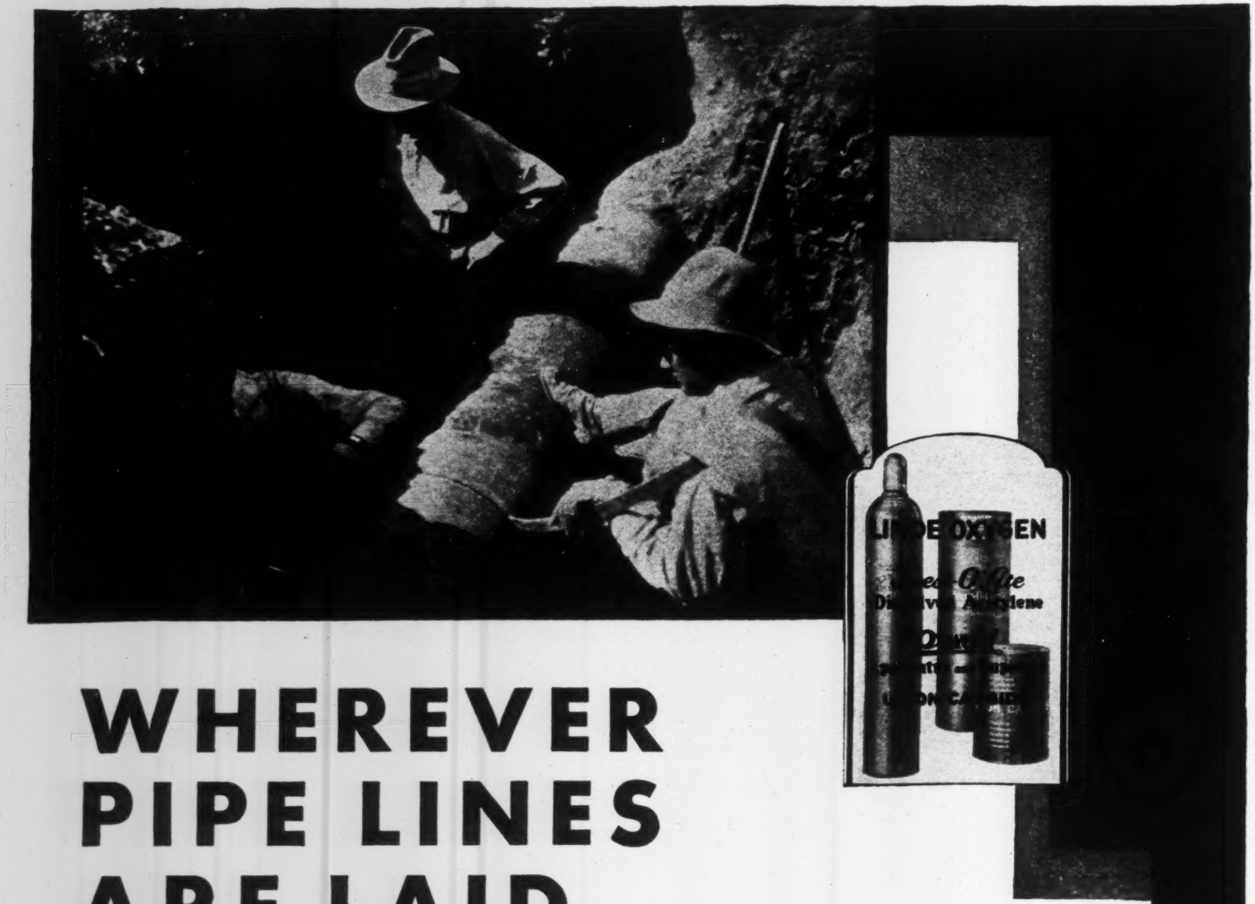
**Mo., St. Louis**—International Shoe Co., 15th St. and Washington Ave., 10 story, basement, 200 x 310 ft., rein.-con., brick warehouse, 15th and Morgan Sts., to James Black Masonry & Contg. Co., 803 Louderman Bldg. Est. $1,500,000.

**Pa., McKeesport**—Fort Pitt Steel Casting Co., Houghton Ave., 2 story, 31 x 68 ft., brick, steel warehouse addition, Houghton Ave. and Baltimore & Ohio R.R., to Blair & Mack, 920 Market St.

**Pa., Pittsburgh**—Baltimore & Ohio R.R. Co. Baltimore & Ohio Bldg., Smithfield St., H. H. Harsh, div. engr., 2 story, 45 x 603 ft., brick, stone warehouse, 2 story, 45 x 80 ft., brick office, 200 ft. loading platform, from Manchester Bridge, to Scotland Ave., to Ellington Miller Co., 25 East Jackson Blvd., Chicago, Ill. Est. $150,000.

**Tex., Baytown**—Humble Oil & Refining Co., Humble Bldg., Houston and Port Arthur, 1 story 173 x 420 ft., brick, rein.-con., structural steel, day labor; structural steel, to Orange Car & Steel Co., Orange; roofing, to Johns-Canville Co. of Texas. Est. $225,000.

*See proposal advertising on page 136*



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LINDE Process Service is an important factor in assuring economical installation and satisfactory performance. It brings to the firing line the results of intensive laboratory research and years of experience pioneering the field. It helps organize the work under standards dictated by the best engineering and field practice.

This service has demonstrated its ability to lower costs, speed up the work, and enable the production of a permanently tight line with tough, ductile welds as strong as the pipe—fully 100 per cent. efficient.

Linde Process Service is available to users of Linde Oxygen.

THE LINDE AIR PRODUCTS COMPANY, THE PREST-O-LITE COMPANY, INC., OXWELD ACETYLENE COMPANY, UNION CARBIDE SALES COMPANY,

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**General Offices . . . . . . . . . New York UCC Sales Offices . . . in the Principal Cities**

65 Linde plants . . . 48 Prest-O-Lite plants . . . 174 Oxygen Warehouse stocks . . . 156 Acetylene Warehouse stocks
42 Apparatus Warehouse stocks . . . 245 Union Carbide Warehouse stocks